The Journal

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AMERICAN DENTAL ASSOCIATION

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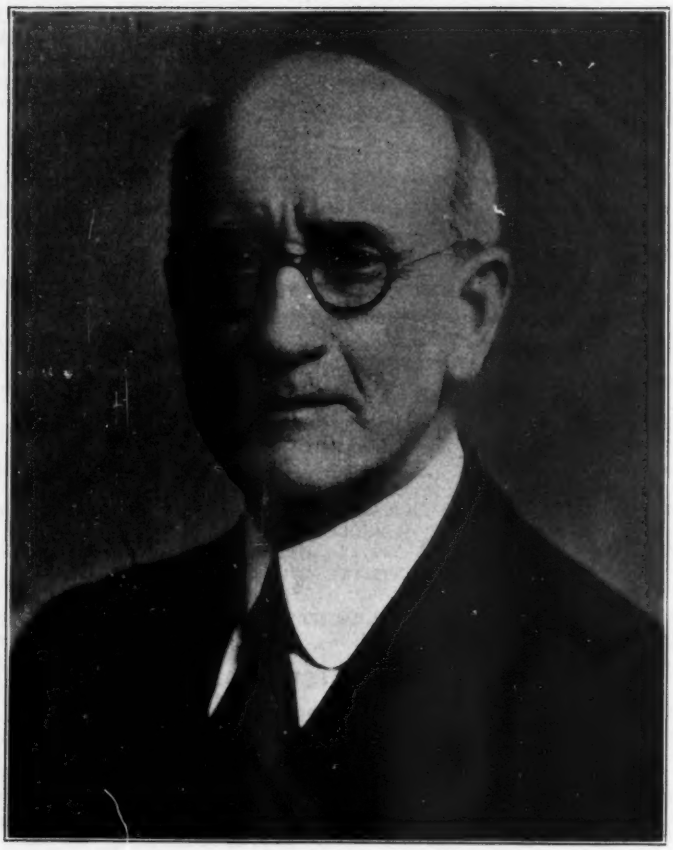

S. BLAIR LUCKIE, D.D.S., Chester, Pa.
Vice President of the American Dental Association

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MALOCCLUSION AND ALVEOLAR RESORPTION AS ETIOLOGIC FACTORS IN ORAL TUMORS

By HAROLD A. SOLOMON, D.D.S., and EUGENE M. BURKE, B.S., Buffalo, N. Y.

MALOCCLUSION and alveolar resorption should be looked upon as etiologic agents in benign and malignant oral tumors. These factors, which have not received the consideration they warrant, should be placed in the same category as the jagged, carious tooth, tobacco, syphilis and lack of hygiene.

While actually these processes are closely associated, for explanatory purposes we shall consider them separately.

Occlusion as applied to the mouth may be briefly defined as the act of closing the jaws and bringing the teeth together as in mastication. Members of the dental profession have long been impressed with the importance of alinement of the natural and artificial teeth. Properly alined and occluded natural or artificial teeth are so designed as to permit integration of the opposing teeth without cusp interference or the overload of stress.

From the State Institute for the Study of Malignant Diseases.

Read before the American Association for Cancer Research, Pittsburgh, Pa., March 19, 1940.

Should a tooth be out of alinement, excess stress will be placed on it and its supporting structures. Instead of the force of mastication being transmitted to and absorbed by several teeth and being distributed over a large area, it will be delivered in a concentrated excess load on and around the maloccluded tooth. Black[1] found the average force exerted by the molar teeth in 1,000 persons to be 171 pounds. It appears obvious that misdirected force of such magnitude could do considerable damage to improperly formed dental structures.

Sorrin[2] writes:

> Few people possess a sufficient resistance to withstand indefinitely a continued traumatic occlusion. The result is that unless the traumatic occlusion is relieved, there will sooner or later occur a definite breaking down of the periodontal tissues.

Response to occlusal traumatism varies with the individual, as do other forms of irritation and malfunction. As stated elsewhere,[3] it is not unreasonable to suppose that in persons having the power of tissue growth and repair, proliferation of tissue results from attempt of the body to replace the resorbed osseous structure,

Fig. 1.—Fibropapilloma on lingual aspect of lower right bicuspid region. The carbon paper markings on the occlusal surfaces of the teeth are heaviest on the first bicuspid where the tumor originated.

Fig. 2.—Cross-section of fibropapilloma shown in Figure 1.

Fig. 3.—Fibropapilloma on facial aspect of gum of upper right cuspid and lateral incisor. There is marked malocclusion and teeth are missing.

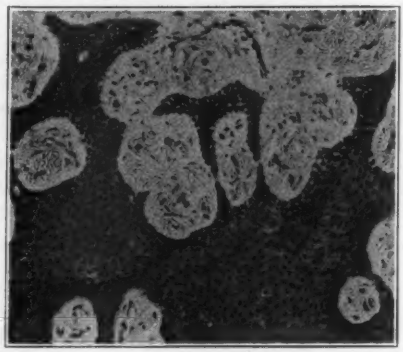

Fig. 4.—Cross-section of fibropapilloma shown in Figure 3.

in an effort to prevent loss of the tooth.

The resultant hyperplastic tissue apparently originates, as Mead[4] and others state, "from the periosteum of the underlying bone, usually at the border of the dento-alveolar process," or the connective tissue between the periosteum and the gum.

Microscopic examination[3] of such inflammatory lesions reveals development of immature tissue. Points of similarity are noted, such as thickening of the surface epithelium, with ulceration and loss of the covering membrane. In keeping with the inflammatory origin, plasma-cell infiltration is an integral part of the tissue. Fibrous tissue stroma, which forms the background, is present, but various degrees of cellular activity are noted. The hyperplastic tissue ensuing, which can be classified as epulides, sometimes contains areas in which degenerated bone appears. The angiomatous gum tumors, with their multiplicity of dilated vessels, show extreme variations in size of the vessels. Observation has shown that such

Fig. 5.—Giant-cell tumor in lower left second bicuspid region in case shown in Figure 3. Both lesions were present when the patient was admitted. Some teeth were missing and others malposed.

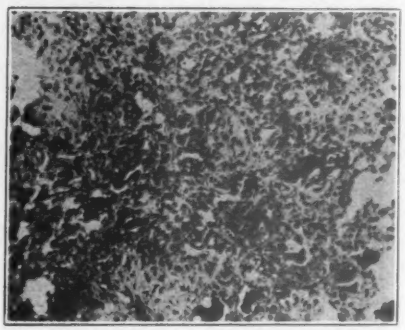

Fig. 6.—Cross-section of giant-cell tumor shown in Figure 5.

Fig. 7.—Fibropapilloma on facial aspect of gum of upper left lateral incisor.

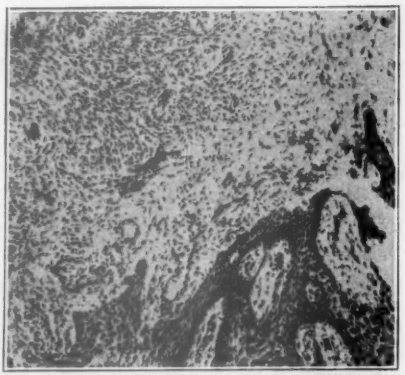

Fig. 8.—Cross-section of fibropapilloma shown in Figure 7.

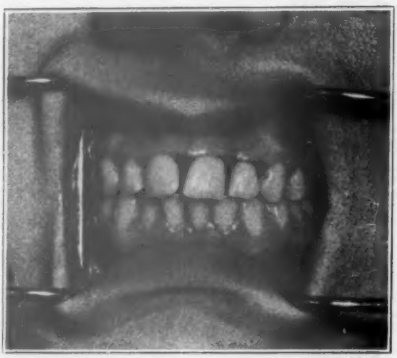

Fig. 9.—Case shown in Figure 7, after surgical removal and healing of lesion and adjustment of occlusion.

Fig. 10.—Epithelioma involving mucous membrane of hard palate. Full dentures had been worn for fifteen years without rebasing. Considerable alveolar resorption had taken place.

a chronic course of events can precede the development of epulides as well as epitheliomas if continued long enough.

As previously reported,[3] we have obtained very satisfactory results in elimination of many epulides by adjustment of the occlusion. The occlusion of the teeth is checked by means of carbon paper, the teeth on which there is the greatest amount of pressure receiving the heaviest carbon markings. These carbon-marked areas are then ground down with fine carborundum stones and polished with pumice-incorporated rubber disks. It might be well to mention that such procedure is not harmful to the teeth if carried out properly.

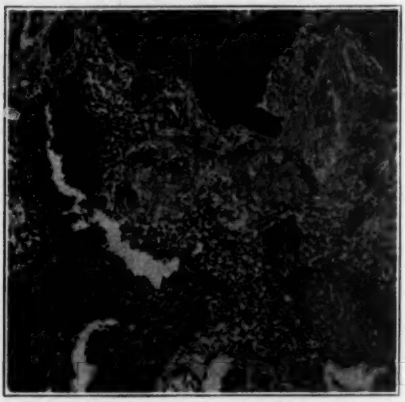

Fig. 11.—Cross-section of epithelioma shown in Figure 10.

Fig. 12.—Epithelioma involving mucous membrane of floor of mouth. Full dentures had been worn for about ten years. Marked traumatization by the lingual denture flange resulted from resorption and subsequent denture impingement.

Such conservative treatment does not sacrifice the functional and esthetic value of otherwise healthy teeth. However, orthodontic treatment of young patients and extraction in the case of older patients must be kept in mind as alternatives. The consensus contraindicates irradiation for such benign lesions.

Alveolar resorption may be described as a loss of bony substance of the alveolar ridge by lysis. This process occurs not only in the bone surrounding mal-occluded natural teeth, as just described, but in the residual alveolar ridges of partially or fully edentulous mouths as well. This likewise can be caused by faulty distribution of masticatory force.

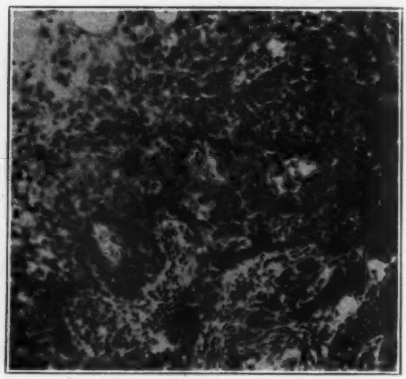

Fig. 13.—Cross-section of epithelioma invading mucous membrane of floor of mouth, shown in Figure 12.

Resorption of residual alveolar ridges in fully edentulous mouths allows the periphery of the denture flange to cut into the mucobuccal fold and thus become a chronic source of irritation. Ewing[5] writes: "Loose and ill-fitting plates frequently rub and erode the adjacent mucous membrane; and after months or years, a warty or eroded can-

cer develops." In many cases, the patient attempts to masticate by use of a full upper denture and natural lower anterior teeth with no lower posterior teeth whatsoever. Absence of lower posterior natural or artificial teeth causes the upper denture to lack posterior balance, and excess pressure is exerted on the anterior portion of the upper residual alveolar ridge. The continued pressure on the anterior ridge causes greater resorption in this region as compared with the posterior ridge. This repeated action allows the anterior portion of the denture flange to extend beyond its original limits and to impinge upon, and traumatize, the mucobuccal fold of the upper lip.

This process invariably results in fibromatous hypertrophy of the lip in the region of the mucobuccal fold. Many of these lesions become ulcerated and chronically infected.

Such lesions can be controlled by surgical removal and subsequent elimination of trauma by insertion of posterior lower artificial teeth, so as to balance and equalize pressure; and by cutting away enough of the upper denture base material to prevent impingement on the mucobuccal fold.

Special effort should be made to impress the edentulous patient with the importance of periodic visits to the dentist for a check-up. Unfortunately, most of the laity believe that once they have full dentures, their troubles are over. However, such is not the case since the residual alveolar ridges resorb and change in contour, the dentures becoming loose and the gums chronically inflamed and infected. Invariably, rebasing and other changes are necessary for normal function and a comfortable fit throughout life.

Failure[6] to have extracted teeth replaced with artificial substitutes can result in malocclusion and alveolar resorption. Teeth adjacent to edentulous spaces tip and absorb undue masticatory stress which, if continued for even a short time in some cases, may cause trouble.

Gottlieb, Orban, Diamond[7] and others have emphasized the fact that "continuous physiological tooth eruption is controlled by the force of occlusion." For example, if natural mandibular teeth are lost, the opposing maxillary teeth will continue to erupt and move down beyond the line of normal occlusion, with chronic occlusal traumatism to the neighboring teeth and supporting structures.

For these reasons, all extracted teeth, except third molars, should be replaced with artificial substitutes. Simpson,[8] Bloodgood,[9] Ewing[5] and others have repeatedly emphasized the importance of eliminating precancerous oral lesions. As a result of our clinical and pathologic observations, we are impressed with the harmful effects which malocclusion and artificial dentures can exert. We hope that more attention will be given to elimination of these conditions in the future.

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113 High St.

THE VALUE OF RADIODONTIA IN PEDODONTIA

By A. Porter S. Sweet, D.D.S.,* Rochester, N. Y.

ADEQUATE and proper use of the roentgenogram is of primary importance in pedodontia. Both specialist and general practitioner appreciate this fact more and more as time goes on and are now beginning to fully avail themselves of this diagnostic aid. Only when all dentists come to realize in full the benefits that will accrue to both the patient and themselves will they use their x-ray apparatus as much as they should.

FIRST EXAMINATION

The first roentgenographic examination of a child's mouth should be made during his first appointment, if possible. How else can a dentist hope to discover all those pathologic and anomalous conditions the treatment of which means so much to the child's future oral health? From this first examination, there are many things that may be discovered, depending on the age of the child.

CARIES

The early discovery of carious areas in the teeth makes it much easier to fill the cavities, because there will be less diseased dentin to be removed. (Fig. 1.) The roentgenogram will also show the exact location and the size of the pulp chamber, thus forewarning the dentist of pulps with long horns or abnormally large pulps, which might have accidentally been exposed had the roentgenographic examination not been made. These two facts make the filling of teeth so much easier that better patient cooperation is automatically secured.

Owing to the different angulation, the bitewing examination is slightly more effective in the search for caries than the periapical examination. This does not mean, however, that the latter should be neglected, as it is impossible to discover some conditions with bitewing roentgenograms, since they do not show all of the roots of the teeth.

CALCIFICATION, ERUPTION AND EXFOLIATION

It is possible, by roentgenographic examination, to study the progressive calcification of the adult teeth of a child. At times, this will be of material benefit in treatment planning.

One is also able to follow the progress of tooth eruption by periodic roentgenographic examination. Thus, premature or delayed eruption can be predicted and progress can be observed, with the possibility of correcting the condition before any great damage is done.

Calcification of the adult teeth and exfoliation of the deciduous teeth should also be supervised (Fig. 2), for it is possible at times, by operative or surgical interference, to assist the jaws to develop normally, rather than permit them to develop abnormally. An example of this is the fact that over-long retention of the deciduous cuspid frequently causes impaction of its adult counterpart. If such a tooth is removed in time, the adult cuspid will erupt normally.

DENTAL ANOMALIES

Discovery of anomalous conditions in the mouths of children is important, for failure to note them might have serious results. Supernumerary teeth may be present in any part of the mouth, but

*Dental Division, Eastman Kodak Company, Rochester, N. Y.

are most frequently found in the bicuspid regions. (Fig. 3.) Another common location, and one where they can do more harm, is above the upper central incisors. Here, they not only interfere with the eruption of one or more teeth, but also may be the cause of a space developing between the adult teeth.

Frequently, roentgenographic examination of either a child or an adult will disclose the congenital absence of one or more adult teeth. (Fig. 4.) Such a condition may be either unilateral or bilateral, and careful study is required to satisfactorily compensate for this deficiency.

Hypoplasia can also be discovered prior to tooth eruption by means of the roentgenogram.

Fig. 1.—Caries in deciduous teeth.

Fig. 2.—Area and extent of calcification of adult teeth.

Fig. 3.—Two supernumerary bicuspids discovered before cuspid has erupted.

IMPACTED AND SUBMERGED TEETH

Early recognition of potential tooth impaction is one of the most valuable aids in establishing a condition of health in the child mouth. The roentgenogram not only reveals the condition, but will also, in many cases, provide information that will be of assistance in determining whether growth alone will suffice to correct the abnormality or orthodontic or surgical interference will be necessary. Impacted teeth (Fig. 5) are a constant threat to comfort and health.

In examining the mouths of older

Fig. 4.—Congenital absence of mandibular second bicuspid.

Fig. 5.—Maxillary cuspid and bicuspid facing possible impaction.

Fig. 6.—Remains of deciduous tooth above submerged and rotated mandibular bicuspid.

children, submerged teeth (Fig. 6) are occasionally found. Failure to discover these teeth is even more serious than is the case with impacted teeth, since submerged teeth usually have at one time been partially erupted and are therefore almost certain to be infected.

In addition to the foregoing are those fragments of deciduous roots (Fig. 7) that the roentgenogram reveals. As with submerged teeth, it is important that they be discovered, for they are potentially dangerous.

INFECTION

The discovery and removal of foci

Fig. 7.—Impacted fragment of deciduous tooth.

Fig. 8.—Periapical abscess of deciduous tooth involving crown of adult successor.

of infection in the mouth is just as important to the health of a child as to that of an adult; more so, in some ways, for the pathosis may interfere with the eruption of the teeth and therefore be contributory to malocclusion. Or, if extensive osteoclasia occurs about the roots of a deciduous tooth and over the crown of the adult tooth, as in Figure 8, premature eruption may occur. The prematurely erupted tooth may exfoliate because there is insufficient root formation to retain it in the bone.

Careful roentgenographic examination and interpretation are essential in dealing with children, since incompletely calcified root apices of both deciduous and adult teeth may resemble areas of infection.

NEOPLASMS

Cysts, odontomes and various other types of neoplasms are occasionally found in the mouths of children. The roentgenogram provides the only means of discovering them while they are still small. Without roentgenographic examination, they would remain undiscovered until they had attained a size that would greatly increase the difficulties. The interest of the patient is best served by early discovery, since the surgical procedure is much easier and healing more

Fig. 9.—Small odontome causing impaction of maxillary cuspid.

Fig. 10.—Diagnostic wire in position.

prompt when they are removed at this time. (Fig. 9.)

ORTHODONTICS

While roentgenography in its relationship to orthodontics is essentially preventive, it has many other important uses. When orthodontic intervention becomes necessary, the roentgenogram is a valuable aid in diagnosis of the case and also a means of checking up on the progress of the treatment periodically.

In this type of work, the profile roentgenogram is of considerable assistance, as well as the usual bitewing and periapical views.

BRIDGES AND SPACE RETAINERS

When it is necessary to make small bridges and space retainers for children, the roentgenogram serves as an aid in designing the appliance. If it is not used, failure may result, since success depends in large measure on conditions beneath the gum tissues that could be determined in no other manner.

ROOT-CANAL THERAPY

There is probably no place in the practice of dentistry where the roentgenogram offers so much assistance to operative procedure as in the treatment and filling of root canals, whether the work is done for the adult or for the child. The sense of touch is relieved of the entire responsibility and that of sight is called on to assist. (Fig. 10.) While it may be possible to do good root-canal work without the roentgenogram, its routine use makes root-canal filling so much easier that time is saved and superior workmanship is assured.

TECHNIC

If the child is very young, roentgenographic examination should be made with the type O bitewing film packet, one for each side of the mouth. If the mouth is large enough, it is better to make the usual 10-film child examination. This examination can be supplemented with a bitewing examination, the size of film depending on the size of the child's mouth. As the child grows older and the mouth becomes larger, it will be possible to make a 10-film examination, using the standard periapical size packet. Still later, when the patient is nearing physical maturity, the basic 16-film roentgenographic examination can be used.

PERIODIC EXAMINATION

According to some authorities, there are dentists who err in not using the roentgenogram to its fullest advantage in that they do not make periodic examinations.

Simpson[1] is most emphatic about the whole question:

> There are too few radiodontic examinations of children, although the requirements can be outlined definitely and the opportunity for service is great. . . .
>
> At the age of 6 years, radiodontic examinations are indicated annually or oftener to observe the progress of dentition. . . .
>
> There is no convincing argument against routine radiodontic examinations of children: the question is whether dentists will utilize this assistance.

Rhobotham[2] believed in periodic roentgenographic examination as a means of prevention:

> . . . it is clear that frequent roentgen examinations are indicated as an aid in the prevention of focal infections. . . .
>
> Children's dentistry is always referred to as preventive dentistry. If properly done, it is the only practical form of preventive dentistry. It can be aided materially by the regular and free use of roentgenograms. It cannot be practiced with any degree of perfection without the aid of roentgenograms.

Some believe that periodic roentgenographic examination should begin still earlier. Fixott[3] says:

> Roentgenographic examinations of children's teeth should be made at regular intervals beginning with the second year, in

order to follow the development of the deciduous and permanent teeth and for the detection of conditions leading to malocclusion, abnormal development and degenerative diseases. . . .

The first step in the care of children's teeth by the general practitioner, the orthodontist or the pedodontist should be a routine roentgenographic examination and periodic checking up, including the use of bite-wing films in examination of posterior teeth. This will enable the dentist to recognize degenerative diseases of the oral structure in the beginning and to institute remedial measures that will go far in the prevention of the serious systemic results of such conditions.

Remember: There is no substitute for the use of roentgen rays in children's dentistry.

CONCLUSION

From the foregoing, it is reasonable to draw the conclusion that the roentgenogram is essential to the practice of children's dentistry. Its use, however, should not be haphazard and desultory, but careful, exacting and frequent. When this is the case, children's dentistry will truly be preventive dentistry.

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A STUDY OF INFLAMMATORY CONDITIONS THAT THE DENTIST SHOULD RECOGNIZE

By LYALL O. BISHOP, D.D.S., Berkeley, Calif.

THE progressive and well-informed dental practitioner is constantly on the watch for the unusual within his line of vision, and yet he frequently fails to recognize the more common cases of inflammatory swelling, with which he should be familiar. Naturally, many of these swellings present a similar appearance and like symptoms to the less-experienced practitioner, but each of them also presents some particular manifestation which differentiates it from all others. Hence, it is the purpose of this paper to consider many of these inflammatory conditions with special reference to their individual characteristics.

Inflammatory conditions may be classified under two headings: (1) septic, which are those local effects of a reaction to microbic infections, and (2) nonseptic, which are those produced by mechanical, thermal or other irritations.

Before entering into the main theme of this paper, I should like to review briefly the inflammatory process. Most authors are agreed that the phenomenon of inflammation is one which may vary greatly, depending on (1) the virulence of the irritant and (2) the resistance of the tissues. Hence, to define the process itself, one must take into consideration the physiologic changes which ultimately take place during this process.

According to Blair, when micro-organisms have gained access to the tissues, producing a septic inflammation, there is first a primary contraction of the blood vessels, with an increase of the blood current, then a dilatation of the vessels, with a slowing of the current, followed by an arrest of the blood current. As

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this blood current slows down, the leukocytes accumulate along the walls of the veins and cling to the walls of the capillaries, finally passing through the walls of these vessels in a process known as emigration. At the same time that this is taking place, the red cells and blood serum find their way into the surrounding tissues through the walls of the capillaries in a process known as diapedesis. Now, as the micro-organisms invade the tissues, there is a steady increase in the number of leukocytes outside the vessels, until they have massed around the bacteria, ready to give battle. If the bacteria win, there is disintegration of the connective tissue cells, with formation of pus. If the leukocytes have been able to withstand the challenge, there is a gradual subsidence of the inflammatory process as the leukocytes diminish in number, returning to the circulation by way of the lymph spaces.

During the non-septic inflammatory process, we find an overgrowth of connective tissue with the resultant mass depending on the duration of the irritating cause and the possible lowered resistance of the tissues due to infection.

In any consideration of inflammatory conditions, one must always bear in mind the five cardinal symptoms of inflammation: (1) heat, (2) pain, (3) redness, (4) swelling and (5) disturbance of function. The differentiation in the degree of each of these in the many inflammatory conditions should be the basis of diagnosis.

SEPTIC INFLAMMATION

The most common swelling, which is usually recognized, is that resulting from an acute periapical abscess. The clinical symptoms here are acute pain with tenderness around the offending tooth, formation of pus with escape through the bony plate and subsequent swelling of the soft tissue. There is a rise in temperature with a general feeling of malaise and systemic disturbances.

In contra-distinction to the former is the periodontal abscess, which rarely involves the face, there being a localized swelling in the gingival tissues and a pericementitis concurrent with the swelling rather than a previous toothache.

The so-called submaxillary abscess which results from an infected lower molar may progress slowly over a period of days with little pain, except on percussion of the offending tooth, until fluctuation is present. The greater part of the swelling is below the lower border of the mandible, and, without proper treatment, there may be rapid infiltration, with penetration to the deeper tissues of the neck. The presence in the mouth of a badly carious lower molar in this type of swelling should confirm the fact that one is dealing with an inflammatory condition, which may be considered a forerunner of a more serious and complicated picture, osteomyelitis with subsequent sequestrum formation at the lower border of the mandible.

REPORT OF CASES

CASE 1.—A man aged 60 presented a submaxillary swelling of one week's duration. Examination of the mouth disclosed a badly carious lower first molar. External incision was made for drainage; and when trismus and swelling had subsided, the offending tooth was removed. Two weeks later, roentgenographic examination revealed a sequestrum on the lower border of the mandible, which was removed through the previously made incision. No further treatment was necessary.

CASE 2.—A girl aged 9 presented a submaxillary swelling of about five days' duration. Examination of the mouth revealed a badly carious lower first molar. External incision was made for drainage, and after the acute symptoms had subsided the tooth was removed. Two weeks later, a slight swelling was present. Roentgenographic examination revealed a sequestrum at the lower border. This was removed through the previously made incision and no further treatment was necessary.

One type of inflammatory swelling

that is much more prevalent in the lower jaw than in the upper is that due to a subperiosteal abscess. It differentiates itself from the submaxillary abscess chiefly in that it is confined to an area above the lower border of the mandible. It is first evident as a round and very tender swelling in the cheek directly over the offending tooth. As pus formation takes place, there is a burrowing through the bone to the periosteum, which is gradually stripped away from the bone as the pus continues to form and push out under pressure. The picture now becomes, externally, one of a diffuse swelling over the mandibular area on the affected side and, in the mouth, a bulging of the vestibule throughout the entire area from which the periosteum has been raised. Another point of differentiation is the extreme pain and tenderness of a subperiosteal abscess in contradistinction to the dull, throbbing pain of a submaxillary abscess.

The increasing number of lower third molars extracted today has, among these inflammatory swellings, focussed attention on the condition of cellulitis. The rapid infiltration of the cellular tissues following the removal of an impacted mandibular third molar brings about a swelling accompanied, as a rule, by a dull, throbbing pain or merely a feeling of fulness. The condition reacts very favorably to proper treatment. There is little if any rise in temperature and the patient may be quite comfortable. This swelling is not to be confused with the hard diffuse type, which often follows these extractions and may be due to one of many conditions. Clinically, there is a variation in the rise in temperature, with a corresponding increase or decrease in the pulse rate, a symptom which alone may warn one as to the progress of the case. There is a general feeling of malaise accompanied by chills and sweats, with subsequent suppuration of the congested area accompanied by severe pain. It is imperative, in these cases, that incision for drainage be made when fluctuation is present.

In any discussion of cellulitis, there should of course be included the phlegmon known as Ludwig's angina. Although this is not of common occurrence, one should always bear in mind the fact that, in a person of lowered resistance, the more common cellulitis and adenitis may be the forerunner of Ludwig's angina. The hard, boardlike swelling involving the sublingual, submental and submaxillary regions is a definite clinical entity, and as such should impress one with the fact that proper treatment, instituted early, in these cases of cellulitis, may obviate radical surgical treatment.

Following extraction of many lower third molars, especially that which some operators may term a simple extraction, there appears a severe and painful edema of the throat, the patient complaining of inability to swallow and the breath having a very fetid odor. Externally, most of the swelling is in the submaxillary region, and, without early proper treatment, there is a rapid infiltration into the submental region, leading to a more complicated condition.

The swelling which accompanies osteomyelitis of the mandible may be easily confused with that of a septic parotitis because of the area involved in both diseases. The predominance of cases of osteomyelitis resulting from infections of lower molar teeth brings about this similarity owing to the fact that, in the more severe cases, the infection travels backward through the inferior dental canal, involving the ramus of the mandible; such infection bringing about rapid infiltration into the tissues of that area. The distinguishing clinical features should be a purulent discharge from Stenson's duct in a septic parotitis, and the confirmation by roentgenogram of suspected osteomyelitis, since early diagnosis of this disease from a purely clinical standpoint may be difficult.

The education of the average layman along dental lines has progressed to such a degree in the past few years that, more and more, the dentist is called upon to make a diagnosis of conditions which heretofore had been left to the physician. I refer to (1) abscesses resulting from tonsil infections, the symptoms of which may be very similar to those of a pericoronal infection of a lower third molar, with swelling in the submaxillary region and inability to swallow, but not such a marked degree of trismus in the former as in a pericoronal infection, and (2) swelling of the upper lip, due to carbuncles and herpes, the swelling often reaching such proportions that it may be easily confused with an acute swelling resulting from an abscessed incisor tooth, unless a thorough examination of the mouth is made.

Infectious parotitis or mumps is many times first observed in the dental office, but is not always diagnosed. The oral examination, the history of the patient and a remembrance of the anatomy of the face should make one suspicious enough to refer the case to a physician for proper treatment.

NON-SEPTIC INFLAMMATION

Under non-septic inflammations are many that may be apparent in the mouth, but because one is prone to slight those things of which he has no definite knowledge, they are left untouched. I refer to those conditions involving the mucous membranes of the mouth, such as (1) leukoplakia, a definitely proved precancerous condition appearing first as bluish white patches on the mucous membranes of the cheek and tongue, the patches later becoming thick and leathery as hornification of the epithelium of the mucous membrane takes place; (2) lichen planus, which probably offers the greatest difficulty in differential diagnosis owing to its similarity to leukoplakia, but the lesions of which, if closely observed, may be seen to be a network of a more delicate texture, bluish white; (3) Fordyce's disease, a harmless condition found in the majority of normal mouths, distinguished by the masses of small yellowish bodies usually found extending from the corner of the mouth backward on a level with the occlusal plane of the teeth, and (4) retention cysts of the muciparous glands of the lips and buccal membranes, usually recognized by their distinctive bluish color and which are freely movable and present a perfectly round appearance.

Under this heading must also be included ranula, a much discussed condition as to both the origin and the nature of the cyst. It is a fluctuating mass appearing in the anterior part of the floor of the mouth, bluish-white and not painful and does not pit on pressure.

Salivary calculus in the submaxillary gland causes a unique swelling and one which should be easily diagnosed from the location of the swelling and the history of the patient, the complaint being that on eating, or possibly at the mere sight of food, there is an increase in the size of the gland accompanied by sharp pain. Roentgenographic examination should confirm the presence of a stone or some foreign body in the duct or even in the gland itself.

Dental cysts require little introduction. The frequent use of the x-ray machine today in routine oral examination brings many of these to light before they reach a stage noticeable because of swelling in the mouth or externally. However, there are still many cases that go unobserved. Any smooth bulging of the periosteum, although unaccompanied by pain and many times unnoticed by the patient, should lead to a tentative diagnosis of dental cyst until roentgenographic examination can be made and the exact etiology be determined.

Any discussion of inflammatory swellings would not be complete without some consideration of tumors of the oral cavity. Authorities on these conditions have

given us intelligent classifications of the benign and the malignant tumors, and one need but observe the amount of literature to be found on the subject to realize that the dentist should play an important part in the early diagnosis of these tumors.

Probably the most common benign tumor of the oral cavity is the epulis, a firm, fibrous, pedunculated mass occurring on the gums, usually between two teeth. The patient may not even be aware of its presence until constant irritation has caused its development into a definite foreign body in the mouth, interfering with normal function.

Lipoma, probably the most benign of the oral tumors, may be found in any part of the mouth, arising from deep adipose tissue. Unless it is mixed with other types of tissue cells, diagnosis may be quite easy.

The small dark blue tumor found on the lips or in the vestibule of the mouth is the hemangioma. The distinctive color of this tumor is due, of course, to its copious blood supply, and careful treatment should be observed in the handling in order to prevent severe hemorrhage.

In this group is also included the lymphangioma, appearing as a small, cystic-like tumor, yellowish-blue, and usually found on the tongue.

The papilloma is benign, but rapid proliferation and ulceration may occur if it is in an area of mechanical irritation. The lesion, which usually occurs on the lips, gums, tongue and sometimes on the uvulae and pillars of the fauces, is simply an overgrowth of the normal papillary structures of the mouth.

In dealing with malignant tumors, we have a group which are easily recognizable in the mouth as definite inflammatory masses. Accurate diagnosis cannot always be reached by clinical examination alone, and roentgenographic examination, to determine resistance, and biopsy should be resorted to in many of these cases. Reference is made here to the epithelial tumors which arise from the mucous membrane and invade the jaws by direct extension. There is a rapid growth of tissue, with a tendency to ulceration. Outwardly, the growth may not appear destructive and may be overlooked until extensive bony involvement has taken place.

Sarcoma and adamantinoma should not go unrecognized even though they are comparatively rare. They both appear more often in young adults, the sarcoma invading the maxillae more frequently than the mandible, while the adamantinoma does just the reverse. Growth is rather slow in both lesions, and pain, although an early symptom, is indefinite. The sarcoma has a tendency to break through the periosteum and invade the soft parts, while the adamantinoma rarely or never invades the soft tissue. Roentgenographically, the adamantinoma differs from the sarcoma in that it is usually polycystic in appearance, and there is no involvement of the periosteum.

Although it is not within the realm of the general practitioner to treat the majority of these cases, his first concern should be with diagnosis. Careful observation of all parts of the oral cavity during a routine examination should reveal any suspicious lesions; and, regardless of their degree or size, they must be considered as potential trouble-makers until further study proves them otherwise. Periodic examination of the mouth gives the dentist the first opportunity to recognize precancerous lesions, and to guide the patient into the proper hands for early treatment, through which the most successful results can be obtained.

Bank of America Building.

METHODS OF SECURING CENTRIC RELATION AND OTHER POSITIONAL RELATION RECORDS IN COMPLETE DENTURE PROSTHESIS

By RUDOLPH O. SCHLOSSER,* D.D.S., Chicago, Ill.

ONE of the most important steps of clinical procedure in complete denture prosthesis is the registration and recording of the positional relation of the mandible to the maxillae, known as centric relation. Because of its great importance, this subject has received much attention, both in discussion at society meetings and in the dental literature. In fact, so much has been written and said about this particular phase of denture prosthesis that one might rightfully ask what more there is that could be added to what has already been told and that would aid the general practitioner in gaining a clearer conception of this specific relation, or simplify its registration.

Those of you who have kept yourselves informed on this subject by reading the current literature and attending meetings where this matter has been under discussion will agree with me when I say that, after all, what we need most to do, to get a clearer conception of the clinical and technical procedure, is to review the available literature thoroughly and discuss more freely the various methods that have been and are being used successfully.

First of all, let us consider a definition of centric relation that, I believe, could be accepted without reservation by all of us: Centric relation is that position of the mandible in which the condyles rest in their respective sockets or fossae, from which all lateral and protrusive movements of the mandible start under normal conditions and to which they return or where they terminate on completion of any of the various excursive movements.

In contemplating the registration of the relation for complete denture prosthesis, it is essential, if not imperative, that an acceptable vertical dimension of the denture space be incorporated with the registration of centric relation. The acceptance of this vertical dimension is dependent on its compliance with the esthetic and biologic needs of the case in hand. In other words, it must properly restore facial length and contour and be readily tolerated by the patient. Appearance and comfort, of prime importance, must be given consideration at the time that the registrations are obtained and records secured and employed.

One thing more that would help us materially to obtain a clearer understanding of the problem is a brief review of the anatomy and physiology of the temporomandibular joint. In this joint mechanism, more properly designated as the temporomandibular articulation, the condyles articulate with the elliptic concave depressions of the temporal bones, called the glenoid fossae. These depressions are situated immediately in front of the auditory canals, from which they are

*Professor of prosthetic dentistry, Northwestern University Dental School.

Dr. Schlosser's paper together with the papers by Dr. Smith and Dr. Glupker, in this issue, were read as a symposium on Securing Positional Relation Records before the Section on Full Dentures at the Seventy-Sixth Annual Midwinter Meeting of the Chicago Dental Society, February 15, 1940.

separated by a thin bony partition limiting the backward movements of the condyles. At the anterior margin of the glenoid fossae is the articular eminence. While the form of the fossae resembles, in reverse, the form of the condyles, the adaptation of the opposing surfaces are not exact. Between each condyle and its socket is the interarticular fibrocartilage, or disk, the margins of this disk being attached to the capsular ligament. This cartilage divides the joint into upper and lower compartments, which are lined with a synovial membrane. The upper is much the larger and extends forward beyond the articular eminence.

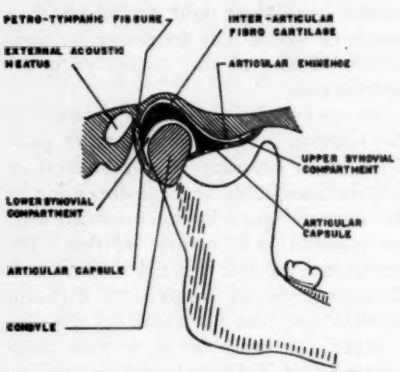

Fig. 1.—Temporomandibular articulation.

The movement in this compartment is chiefly a sliding anteroposterior motion, in which the condyle and the cartilage move as a unit. It is associated with an inward movement during lateral excursions. In the smaller lower compartment, the movement is hingelike.

The various components of this joint mechanism are clearly discernable in the chart in Figure 1, as is also the positional relation of the condyle to the external auditory or acoustic meatus and the articular eminence.

That mandibular movements are in part controlled by this joint mechanism under normal conditions is a well-established fact. The influence exerted by it upon the occlusion of the teeth, particularly of complete prosthetic dentures, must be fully recognized. Coordinate function of all components of the entire masticatory mechanism is a prime essential in all restorative dental operations, from the placing of an inlay to the construction and insertion of complete dentures.

Among the more recently published articles dealing with the subject are papers by Walter H. Wright[1] and Homer Simpson.[2] Both papers are profusely illustrated and contain much useful information. Wright's paper discusses the

Fig. 2.—Transverse line on chin.

use of intra-oral wax records, while Simpson's paper deals with the virtues of graphic methods of registration. Another recent publication in which this subject has been discussed is my book on complete denture prosthesis, in which I have included descriptions of the Hanau, Gysi and Stansbery methods of registration of positional relations. In it, I have also cited thirty-six articles by as many different authors dealing with this subject.

From these and other available sources, any one desiring to familiarize himself

with the diversified opinions held or expressed regarding centric and other relation records can obtain much information. An open discussion of a problem of this nature can of course be easily converted into a prolonged controversy of doubtful significance, unless the participants are willing to grant to their confrères the right to their own opinions, as well as the privilege to express these opinions in spite of any existing diversity.

From the earliest days of the mush bite to the present era of advanced methods of graphic and of static registration of mandibular positions and

Fig. 3.—Measuring distance from base of nose to transverse line on chin.

Fig. 4.—Outline of condyle superimposed on face, showing position of pivotal point.

movements, the real objective has been the registration and the recording and employing of such registration for the purpose of establishing on the articulator or occluding frame positions of the casts and the baseplates or dentures equivalent to those existing in the patient, and all this in order to facilitate setting, arranging, occluding and articulating the opposing teeth in conformity with the functional and esthetic requirements of the case in hand.

Just as men in the past have used different methods and appliances, so do the men of the present and so will men of the future use different procedures and instruments for the performance of similar operations. There is little to be gained by merely criticizing what other men do. Infinitely more can be accomplished by making a periodical analysis or criticism of our own methods and behavior. Because I am firmly convinced that this is reasonable, I shall describe to you the clinical and laboratory or technical procedures for registering positional relations for complete denture prosthesis that we have consistently employed for the past sixteen years.

I shall begin by outlining the special clinical and technical operations pertaining to the positional relations involved in the construction and servicing of complete prosthetic dentures, the first of which is that positional relation of the edentulous mandible to edentulous maxillae which registers an acceptable vertical dimension of the denture space; the second, the relation of the accepted

denture space to the condylar hinge axis; the third, centric relation as previously defined, and the fourth, the protrusive relation of the mandible both in the median and in the lateral positions.

All of these jaw relations must be properly recorded and incorporated in mounting the supporting casts upon the articulator, to facilitate the arrangement of the teeth in compliance with the esthetic, mechanical and biologic requirements. The same or subsequent records of the same relations will also serve indirectly, through setting of the controls of the articulator that govern the movements of the instrument, to simulate, within reasonable limits of accuracy, the individual mandibular movements of the patients for mechanical modification of the tooth forms in accordance with individual needs. By the latter procedure, any occlusal disharmony or cusp interference in the processed dentures is diagnosed. Their removal by judicious grinding with small stones, as well as the ultimate milling-in with abrasive paste, is the final step in the establishment of proper occlusal balance in all normal mandibular positions.

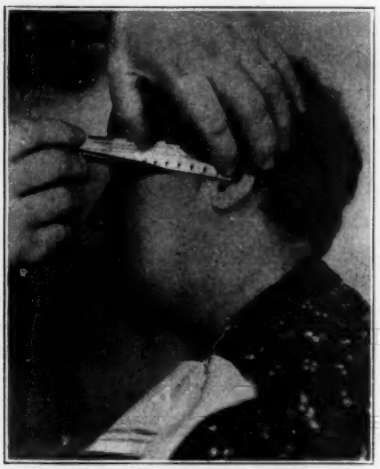

Fig. 5.—Marking condylar position on face.

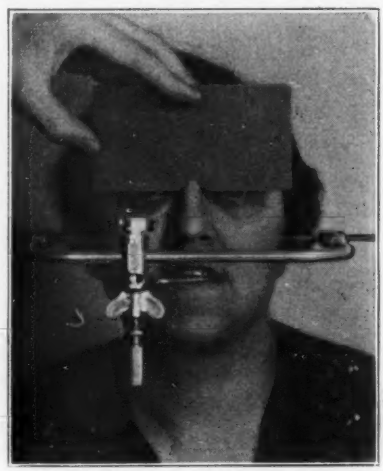

Fig. 6.—Checking position of facebow for parallelism with pupillary line.

REGISTERING AN ACCEPTABLE DENTURE SPACE

Regardless of the method to be employed in the registration of positional relations, it must be conceded that well-fitting rigid baseplates, extended to the limits of biologic tolerance and properly trimmed and polished at their peripheries, are much to be preferred to baseplates made of materials liable to distortion during use. As a clinical routine, we employ bases made of either vulcanite or acrylic resin, and molded and cured on casts of artificial stone. Whenever we use shellac bases, which we frequently do in the case of single upper dentures, we take particular care to adapt this material as closely to the cast as possible. We also reinforce such bases along the periphery, especially at the posterior border. We sometimes use vulcanite bases lined with zinc oxide oil impression paste.

Into the acrylic or vulcanite baseplates, casts of plaster of Paris are poured. These are subsequently referred to as mounting or supporting casts because they are mounted on the articu-

lator and serve to support the baseplates or dentures during all future operations. An occlusal rim of modeling compound is attached to the mandibular baseplate and is made to conform to the curve of the arch, which is about 9 mm. high in the incisor region. At this plane, it is extended back to the second molar region. In place of attaching an occlusal rim to the maxillary baseplate, we make a tentative setup of the teeth or, as an optional procedure, we set the six anterior teeth and attach posterior segments of an occlusal rim.

We find that this tentative setting has

Fig. 7.—Sagittal view of facebow on face.

numerous advantages, though it may not be found so convenient when the graphic method of registration is to be used.

THE DENTURE SPACE

Having prepared the bases with setup and rim, and having separated the bases from the mounting casts, we are ready to proceed with registration of the denture space. First of all, we check the fit of the baseplates separately for stability, retention and comfort. If they are judged to be defective in any way, corrections are made immediately. Next, we check the tentative arrangement of the maxillary teeth and, at the same time, see to it that they harmonize properly as far as their type, form, size and color have to do with meeting esthetic requirements. Minor corrections in the setting of the teeth can be deferred till the casts have been mounted on the articulator.

There are various factors that must be taken into consideration in determining the vertical dimension of the denture space. While the cephalic index, preextraction records and photographs of the patient taken prior to the removal or loss of teeth may aid us in this determination, we must also take into consideration the age of the patient. In elderly patients, there is often quite an appreciable decrease in this dimension, which may be the result of normal wearing down of the teeth. In such cases, it is not always advisable to attempt too much in the way of a complete restoration, lest we exceed the patient's limit of tolerance.

Lastly, we should strive earnestly to avoid all unnecessary and complicated procedures, particularly if it can be demonstrated that satisfactory results are to be achieved by a more simple and effective method.

My own observations have convinced me that the unstrained contact of the lips in repose can be made to serve effectively as a position of reference in judging the acceptability of the vertical space between the edentulous ridges for the accommodation of dentures. Several years ago, my attention was called to certain experiments in phonetics. Among other things pointed out to me was the relation of lip movements and position in speech action, for instance in the "m" sound. As a result, we conducted a series of experiments in our clinic along these lines. We observed that, during speech, the movements of the mandible were quite evidently subject to an habitual fixation. For instance, we found that edentulous patients were able repeatedly to bring the mandible to an identical rest

position by merely making the "m" sound. We conducted these experiments with 200 patients and, almost without exception, we were able to note this controlled fixation. We attributed this to the more or less subconscious training of the muscles of speech to which the patients had been subjected since learning to make articulate sounds.

It is a known fact that when natural teeth are present, there is normally a space of from 1 to 3 mm. between the upper and lower teeth when the lips meet. My attention has often been called to this when I have referred to the lip contact as the index to an acceptable vertical dimension of the denture space.

Allow me to call attention to the fact that whenever I have made mention of the lip contact in this connection, it has been purely as a position of reference. It is as such that we make use of it in determining the magnitude of the intermaxillary opening known as the denture space.

The clinical operations involved in working out a pleasing restoration of lost facial dimension and contour simultaneously with a suitable dimension of the denture space are carried out in the following simple manner.

The maxillary baseplate with the tentative setting of the teeth having been placed in position, the patient is asked to enunciate the "m" sound a number of times, and then to permit the lips to remain in contact. A line is then drawn transversely over the mental prominence of the chin (Fig. 2) and the distance from the base of the nose to this line is measured and recorded. This may be done with a Boley gage, a millimeter rule or a sheet of baseplate wax, as shown in Figure 3.

The occlusal surface of the mandibular rim is next softened; the lower baseplate is carefully placed in position, and the patient is instructed to close as before, so as to bring the lips into contact. The distance between the nose and the line on the chin is checked to see that it coincides with the previous measurement. If this has been accomplished, the labiobuccal surplus is trimmed from the compound rim, the base is replaced and the restoration is now critically studied to ascertain whether further modification is needed. While it may be argued that a restoration worked out in this manner cannot have as good results as when preextraction records are employed, we have found it very satisfactory. Before we go on to the next phase of the clinical procedure, the patient is given an opportunity to view himself with the aid of both a wall and a hand mirror. He is also asked whether he senses any discomfort, such as may be due to an excessive increase of the vertical dimension. If he feels that, upon closure, the contact seems premature, this is easily remedied by again softening the occlusal surface of the rim and permitting the patient to reduce its height by further closure until a more comfortable position is obtained. It is then recorded by measuring the distance between the nose and the mental prominence, and this is the vertical dimension at which centric relation is subsequently recorded.

If the patient senses no discomfort in the position first recorded, and particularly if he has never worn dentures, it is advisable to accept the maximum vertical dimension.

RECORDING THE GLENOID MAXILLARY RELATION, OR REGISTERING THE POSITIONAL RELATION OF THE DENTURE SPACE TO THE CONDYLAR HINGE AXIS

Because we are convinced that a proper orientation of the casts upon the articulator is of prime importance, and because this can be effectively and easily accomplished by the use of the facebow, we have used this appliance in all denture work for more than twenty-five years. It is nothing more than a simple measuring device with which we can record the positional relation of the max-

illary ridge to the condylar axis three dimensionally in one operation. It obviates the guesswork associated with arbitrary methods for mounting the casts and consumes but a few minutes. Since it has for years been described in our standard textbooks, the technic for its use should require no elaboration. Yet because it is pertinent to this discussion, a brief outline may not be amiss. To accommodate the wax used in this as well as that employed in registering the centric and protrusive relations, the height of the mandibular occlusal rim is reduced by trimming off about 3 mm., after which both bases are placed in the mouth.

The positions of the condyle are marked on the integument as shown in Figures 4 and 5. The lateral rods of the bow are next adjusted over these marks with slight tension. The calibrations are read and equalized and the rods are locked to maintain the equalized calibrations. Soft wax is applied to the prongs of the bite fork and the fork with this wax is placed against the maxillary occlusal surface and held in this position while the patient closes the lower jaw against the under side. The wax record is then chilled. The fork is replaced and the patient is asked to hold it firmly by applying biting pressure. The facebow is now adjusted over the condyle markings and the alinement of the middle portion of the bow is checked to see that it is parallel to the pupillary line, after which it is firmly locked to the stem of the bitefork. (Fig. 6.)

The lateral rods of the bow are now released and moved outward from the face and returned over the marks to assure that the adjustment was not disturbed while the bow was locked on the fork. The record thus obtained is used in mounting the maxillary baseplate and cast upon the articulator.

REGISTRATION OF CENTRIC RELATION

The maxillary base is again placed in the mouth and properly seated. A roll of freshly softened wax about 5 mm. in diameter is placed on the occlusal surface of the mandibular baseplate, and this is carefully but firmly seated upon the lower ridge. No attempt should be made to impress on the patient the importance of this registration, lest he, in his desire to aid the operator, be subjected to a mental strain which in itself may cause him to close incorrectly. He is asked to close normally until the lips meet in an unstrained relation, to open the lips and to close them several times into the same position. The record with the lower base is removed from the mouth, chilled in cold water and then replaced.

The vertical dimension recorded is checked as previously by measuring the distance from the base of the nose to the line on the chin. If the measurement coincides with the previously accepted one, and the patient senses an evenly distributed and simultaneously made contact when the surface of the record meets the maxillary occluding area, the registration is judged to be satisfactory. This record is used to mount the mandibular cast and baseplate upon the articulator.

ARTICULATOR CHECK RECORD OF CENTRIC RELATION

To ascertain the accuracy of the mouth record, as well as for proper mounting of the mandibular cast, a check record is made of the centric relation with the incorporated vertical dimension. This can be done by adding some wax to the mouth record or by making an entirely new record. It should be made to occlude with the incisal edges of the maxillary teeth and, in the bicuspid-molar region, the wax should be cut away so as to create a slight overjet. This overjet will prevent the patient from biting his cheeks.

Both baseplates and the check record are again placed in the mouth, and the patient is once more asked to close gently,

the operator scrutinizing the occlusion to see that the contact is as precise in the mouth as it was on the articulator. As an additional check, the patient is again requested to interpret the contact distribution. He may also be asked to apply biting pressure to test the occlusal balance. A balanced occlusion, whether developed in wax, as in the case of the records, or with porcelain teeth, will at all times aid in stabilizing dentures; while an unbalanced occlusion usually causes displacement of the bases and interferes with their adhesion. It is therefore necessary to be meticulous in the making of records. If, at this time, errors are detected, corrections must be made; which may mean that new records should be made.

REGISTRATION OF THE PROTRUSIVE RELATION OF THE MANDIBLE

Registration of the protrusive relation of the mandible differs from that for centric relation only in that, during closure, the patient is asked to maintain the jaw in protrusive relation. A range of 6 mm. has been found most acceptable for this purpose. It should be noted that, for this registration, the wax should also be quite soft. When the record has been obtained, chilled, replaced and checked for uniform and simultaneous contact, and it is found that it causes the patient neither discomfort nor annoyance because the bases are not displaced by closure, the record is judged acceptable. The record is now used to determine where the horizontal articulator condyle guidance should be set.

THE PROTRUSIVE CHECK RECORD

A check record of protrusive relation can be made by merely remolding the wax that had been used for the mouth record. It, like the centric check record, is used to confirm the acceptableness of the mouth record of the protrusive relation, and to prove that an occlusion developed for this position on the articulator will cause the opposing surfaces to make proper contact in the mouth of the patient. In lieu of registrations of the lateral mandibular positions, we set the lateral guide controls in accordance with the experience formula evolved by Hanau, $\frac{H}{8} + 12 = L$. We find that this simplifies the procedure very materially and, if one desires, lateral check records can be made on the articulator, and these can be used as check records very much the same as those of centric and median protrusive relations. After the articulator adjustments have been made, in accordance with the registrations, the setting up of the teeth is completed and the model dentures are prepared to be tried in the patient's mouth.

We have always considered it advisable to make additional checkups, both with and without records of the positional jaw relations. We do this when the model dentures are tried in as well as when we check the dentures after they have been processed. Our reason for doing this is, first, that we may at all times detect any previously undisclosed error, and, secondly, to check for possible changes that may have occurred in the processing of the dentures. Finally, the fallibility of the operator and his assistants always makes such checkups advisable.

As I have previously stated, the technic which I have described is the one used in our complete denture work since 1923. It is true that, in some of the minor details, we have modified our procedures from time to time, but this we have done primarily for the sake of greater simplification and better coordination.

We prefer to employ it rather than the graphic method of registration because, in our hands, we have found it not only very practical, but also less time-consuming. I do not believe that any of my confrères will accuse me of being unfamiliar with the advantages of the graphic methods for registering positional relations. I became familiar with

it and learned to use the Gysi adaptable articulator more than twenty-five years ago. In our school clinic, we have many different tracing devices and an array of different kinds of articulators and occluding frames, and, from time to time, we conduct research in denture prosthesis. Much of this has to do with a further study of the problem which I have been discussing.

In conclusion, I can but repeat what I have said earlier in this paper: We do not need more papers pertaining to the subject of registrations of centric and other positional relations so much as we need to devote more time to the study of the information now available.

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METHODS OF SECURING CENTRIC RELATION AND OTHER POSITIONAL RELATION RECORDS IN COMPLETE DENTURE PROSTHESIS

By HENRY GLUPKER,* B.S., D.D.S., Chicago, Ill.

PERHAPS the most important aspect of any complete denture technic, particularly in those phases that deal with securing positional relations, is the disagreement that is normally associated with any technic that is offered. This disagreement arises, quite naturally, out of the complexity of the subject and the absence of standardized factors which all prosthetists can use as a starting point for a given operation.

This complexity and this absence of standard factors have resulted in the multiplication of technics, with the result that the average dentist is at a loss to determine which has the approval of men who are highly skilled in this particular field of work. But here again another difficulty is encountered. This lies in the varying ability of operators, their preferences, training and knowledge. On these will depend a man's advocacy of a given technic which for him is a highly successful one. In another man's hands, the same technic, followed as closely as his individual variations allow, will result in failure.

It may be well, then, for the practitioner to examine, more than casually, the various methods that, by common acceptance, have come to be known as fairly reliable in the determination of centric and other positional relations.

Centric relation is still considered the most important positional relation to be established in the construction of complete artificial dentures. Records of the other positional relations have much to do with the success of artificial dentures, but the recording of them can be as confusing to the practitioner as is their use after they have been secured.

There are many opinions about the technics and instruments to be used in

*Associate Professor of Prosthetic Dentistry, Chicago College of Dental Surgery.

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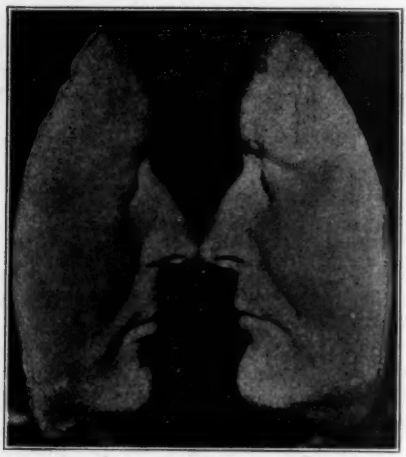
obtaining the various records, but it is not the purpose of this paper to consider them. This paper will deal primarily with accepted principles and with teachings that have proved satisfactory to a reasonable degree and therefore should be acceptable in the average dental practice.

It may be essential in some instances to consider certain technics, but this will be done only with the thought of giving a practical application to the methods.

For purposes of description, the positional relations of the mandible to the maxillae may be considered under two classifications: (1) centric relation and (2) eccentric relations.



A B

Fig. 1.—Lateral view of facial masks; showing approximately four thirty-seconds inch closure from rest position to centric relation. A, rest position. B, centric relation. (Niswonger.)

CENTRIC RELATION

Centric relation may be defined as the relation of the mandible to the maxillae at a given degree of jaw separation in which the condyles are in the most retruded and unstrained position in the glenoid fossae from which all movements emanate. The term "retruded," in the definition, must not be taken as referring to the eccentric relationship of retrusion. A retrusive relation of the condyles, which exists only under abnormal conditions, must be considered as a forced or strained relationship.

Centric relation is the starting position of all mandibular movements and, in the presence of teeth, central occlusion is the terminus of each masticatory stroke. It is a definite relationship of the condyles within the fossae and, in this relation, it is assumed that the mandible is closed somewhat beyond the rest position. The rest position is one of relaxation, from which no definite masticatory movement can be started.

Niswonger,[1] in describing this closure, states that in 83 per cent of 200 patients ranging from 37 to 78 years of age, the moving distance of the mandible, from the rest position to centric relation, was four thirty-seconds inch. (Fig. 1.)

CLASSIFICATION OF METHODS

The methods used in securing centric relation, here considered without reference to any particular instruments or technics, may be classified in two groups through (1) the use of certain arbitrary guides, none of which is dependable in all cases, and (2) the Gysi gothic arch tracing, which is recognized by the National Society of Denture Prosthetists[2] as the only scientific means of verifying centric relation.

ARBITRARY METHODS

In evaluating the first, or arbitrary, method, it should be emphasized that none of these guides can be used individually to verify centric relation in routine procedures. Yet many of these arbitrary guides are often used today, probably because of a lack of understanding of a definite, scientific method. Nearly all of these guides could be questioned as to their true value in locating this relation.

At the risk of dispelling some of the curious and popular folklore of denture

construction, the "American Textbook of Prosthetic Dentistry" is quoted on the significance and reliability of these guides in verifying centric relation[3]:

> It becomes very difficult to secure the jaw in its distal relation. In this operation efforts are directed to compel the patient to close the mouth and bring the bite plates together and to have the jaw slide back to its proper position. Measures which are utilized to fix the plates together at the same time the mouth is closed are open to the criticism that they serve to increase the protrusive tendency if much force is exerted in bringing the jaws together, and great care must be taken to avoid this error.
>
> It must be stated as a truism that the smaller the amount of force necessary to close the jaws, the less likelihood will there be of protrusion. . . . The operator should be able to tell when the jaw is in its distal relation, in which he may be assisted by palpation of the external end of the condyles. . . . Or if the head is thrown backward the tissues of the front of the neck attached to the lower jaw, particularly to the platysma myoides, are put on the stretch, and the tendency being also to carry the jaw backward. Instructing the patient during closure of the mouth to touch the palatal vault with the tip of the tongue . . . asking the patient to bite the back teeth together may assist in securing the position. The method of securing the centric relation record advocated by Gysi is a splendid check upon the correct occlusal relations in all cases. In the opinion of many, it is the only positive means available at present of proving that the mandible has been secured in its distal relation.

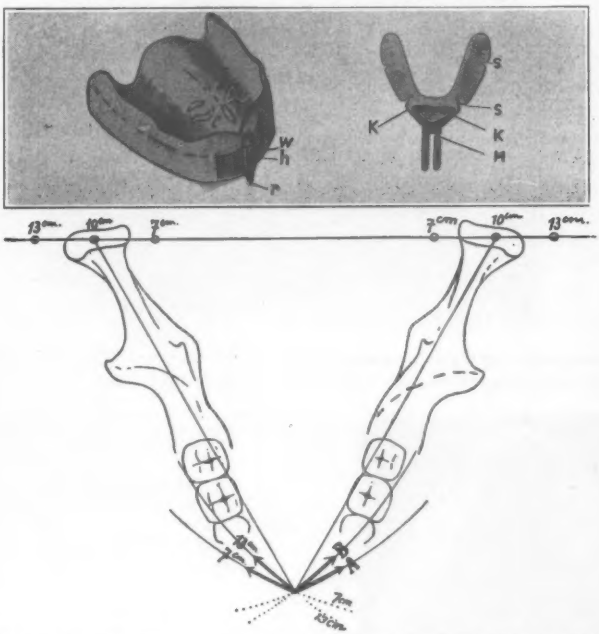


Fig. 2.—Simple appliance used by Gysi to register gothic arch. (Gysi.)

The mere fact that there are so many of these guides indicates why most of them fail to be definite aids in the determination of this relation.

The second method, the Gysi gothic arch tracing, as has been stated previously, is the only scientific means of verifying centric relation. Gysi[4] states that in the year 1901, by the help of a simple method (Fig. 2), he was the first who was able to register in individual

cases the path of the incisor point of the triangle in a horizontal plane (Fig. 3). The triangle referred to in this statement is, of course, the Bonwill equilateral triangle (Fig. 4), which, in the study of positional relations, was chosen as a geometric design of the mandible.

There is still another value to be obtained from the use of this graphic tracing. On many occasions, it will be observed that individual patients in registering the anteroposterior and lateral movements are restricted in certain phases of this registration. It is not unusual for a patient to record one lateral tracing very easily and have extreme difficulty in moving the mandible to the opposite lateral position. This is a clear designation of the functioning side before the loss of the natural teeth and may prove to be of great value in the construction of the artificial dentures. This difficulty mentioned is often to be found in extreme prognathous jaw relations wherein the patient is virtually unable to record either the anteroposterior or the lateral movements. Again, this additional information may prove of value in the selection and arrangement of the artificial teeth.

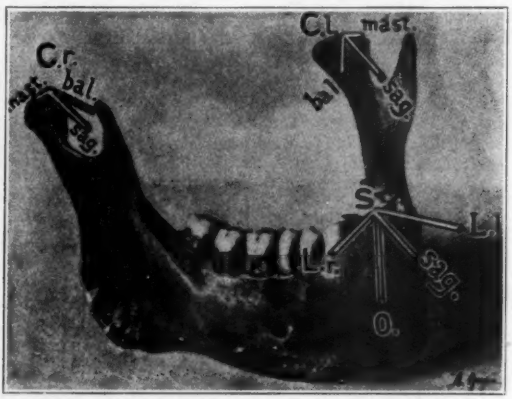
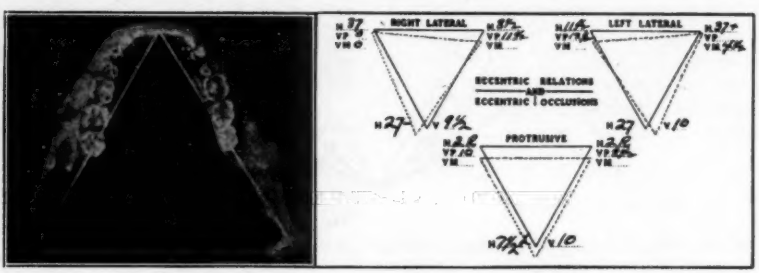


Fig. 3.—Gysi gothic arch tracing (recording of incisor point). L.R. to S., right lateral movement. L.1., left lateral movement. sag. to S., incisive movement. (Gysi.)



A B

Fig. 4.—A, Bonwill equilateral triangle. B, eccentric relations, right and left lateral, and protrusion. (Hall.)

Since the recognition of the reliability of the gothic tracing in determining centric relation, many technics have been devised to put the method to practical application. The operator may choose a very simple method or, if he desires, a

more elaborate one. Until the basic principle has been mastered, it might prove more satisfactory to those unfamiliar with the gothic tracing to select a comparatively simple technic.

For the general practitioner, the use of occlusion or relation models would seem advisable because certain essential records necessary in the construction of artificial dentures are secured through their use. In addition to being used to record centric relation, occlusion models will also aid in securing the following records: the incisal plane, the anteroposterior plane of occlusion, the lateral plane of occlusion, the midline of the face, the high lip line, the cuspid eminences and the facial contour.

Fig. 5.—Hight tracing device with central bearing point, mounted on occlusion models. (Simpson.)

In establishing the denture space (which is the vertical space between the opposing ridges) by the use of occlusion models, much depends on the operator's judgment as to the space necessary to satisfy the mechanical and the esthetic requirements. There are many anatomic guides that may be used to determine the correct denture space. Certain mechanical profile guides are useful but should not be relied upon as being correct in all cases. Probably the most important use to which profile guides can be put is the securing of facial measurements as preextraction records. These records will prove of immeasurable help in determining the vertical space.

It is not necessary here to give a technical description of the formation of occlusion models. Rather, let us assume that proper occlusion models have been prepared and proceed to a consideration of the gothic arch tracing.

The use of the central bearing point, as advocated by Phillips, is intended primarily to stabilize the models and thus prevent their displacement during the various movements of the mandible.

The occlusion models must be reduced approximately 2 mm. from the correct vertical dimension to allow for the placement of the central-bearing plates. This vertical space is restored by raising the central-bearing point until the correct degree of jaw separation is secured.

INTRA-ORAL AND EXTRA-ORAL REGISTRATION METHODS

At this point, the operator may select either the intra-oral or extra-oral tracing device for recording the gothic tracing. Many favor the extra-oral type (Fig. 5) because the tracing is clearly visible without the necessity of removing the occlusion models from the mouth. Some of the intra-oral instruments are so designed that a lock can be placed at the apex of the gothic tracing to maintain the correct relationship while the occlusion models are being attached. It does not matter whether the intra-oral or extra-oral instrument is selected as far as basic findings are concerned because both have the single purpose of merely recording the gothic tracing. The stylus or tracing pin is usually placed on the maxillary occlusion model and the tracing table upon the mandibular, but this can be reversed if desired. In order to record

the graphic tracing, the table is smoked with a carone smudge. A pellet of cotton moistened with xylene and ignited has proved satisfactory for this purpose.

The occlusion models are placed in the mouth and the patient is asked to make an anteroposterior movement. By this movement, the incisor path is recorded. The lateral movements are registered in a similar manner. It will be found that a correct graph will resemble an arrow head. The stylus, resting at the intersection of the three lines, will indicate

Fig. 6.—Extra-oral method of registering gothic arch (A and B). When the stylus is in the apex of the gothic arch, the mandible is in centric relation. C, registering of lateral incisor path. D, gothic arch and record of protrusive movement. (Gysi.)

true centric relation. There is a choice of three materials to fix this relation by attaching the occlusion models to each other: compound, wax and plaster. Some prefer to place a small roll of compound or a thickness of soft wax between the occlusion models. By closing, the patient then fixes the relation. Others favor the injection of plaster for the same purpose; but for all practical intents either may be satisfactory if the stylus assumes the correct position as to the apex of the gothic arch tracing.

Hall[5] defines so-called "functional centric relation" as "that relation of the mandible to the maxilla about which the mandible functions as a center in mastication." He continues:

> This center has been found in some cases to differ from that indicated by the gothic arch tracing after Gysi, and assumed to be functional. (Fig. 7.) Failure to recognize this fact and to restore occlusion according to the functional centric relation accounted for trouble with the occlusion in at least one of my full denture restorations.

Without a doubt, many will recall certain cases in which this condition was observed. The question as to which relation should be registered is then immediately presented. It has been our practice

to register the true centric relation, and by the use of a non-anatomic form of posterior tooth to so arrange the teeth that they may function to balance in both the true and the functional centric relationship. This functional centric relationship is usually observed in extreme cases of mandibular retrusion or retrognathous relationship of the jaw ridges.

ECCENTRIC RELATIONS

In transferring the attention from the verification of centric relation to the establishment of the other positional relations, certain definitions will be helpful.

Protrusive relation may be defined as that relation of the mandible to the maxillae in which the teeth are in incisive occlusion, or the relation that would maintain if the teeth were present. (Hall.) Lateral relation is that relation of the mandible to the maxillae in which the teeth are in lateral occlusion, or the relation that would maintain if the teeth were present. (Hall.)

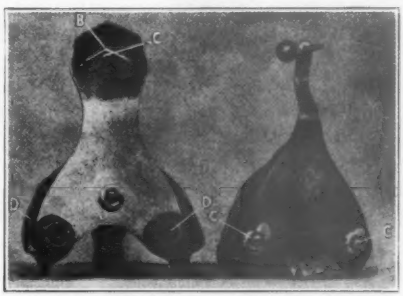


Fig. 7.—Registration plates mounted on baseplates; showing apex of gothic arch at B and functional centric relation position at C, as developed by patient and recorded with path marker. (Hall.)

In considering the methods of securing these positional relation records, all technics may be reduced to four basic methods:

1. The extra-oral method, suggested by Gysi.
2. The intra-oral check-bite method with wax or compound, suggested by Christensen.
3. The intra-oral check-bite method with plaster, after Kanouse and Phillips, improved later by Stansbery.
4. The extra-oral dual tracings, suggested by Phillips, Sears and Terrell.

EXTRA-ORAL METHOD (GYSI)

The extra-oral method with the use of the facebow as advocated by Gysi is being used to a certain extent. Occlusion models of either wax or compound are formed and the stylus and registering table are attached for the gothic tracing. The registering table is of a certain design with an arm on each side of the table for the attachment of the facebow. The gothic arch is traced and centric relation established.

To record the sagittal inclination, the extra-oral graphic method is used. (Fig. 8.) The facebow is attached to the arms of the tracing table, and the registering points are adjusted to the condyles. By placing a smoked card under the registering points parallel to the facebow and firmly held against the head over the condyle area, the protrusive path can be registered. (Fig. 9.) From these records (the lateral movement of the incisor point, which is the gothic arch tracing, and the sagittal inclination of the condyles), the articulator is adjusted.

INTRA-ORAL CHECK-BITE METHOD WITH WAX OR COMPOUND

The second method of registering positional relations through the use of the intra-oral check-bite with wax or compound was first called to our attention by Christensen, of Copenhagen. (Fig. 10.) He found that occlusion models with flat occlusal planes would, in the protrusive relation, make contact only in the anterior region, with separation in the molar area. The amount of separation was dependent on the downward inclination of the condyle paths. This principle employed to secure the pro-

trusive relation is now widely used to register the lateral relations as well.

One of the best descriptions that can be found in the literature on the use of intra-oral check-bites of compound or wax is that of Tench[6]:

> The making of records for the registration of the masticatory movements of the mandible in an articulator is a relatively simple operation. It requires the interposing, successively, between the occlusion rims, of two or three small rolls of compound when the patient holds the mandible in the closed right lateral, closed left lateral and, if desired, in the incising position. . . .
>
> The precautions to be observed in the

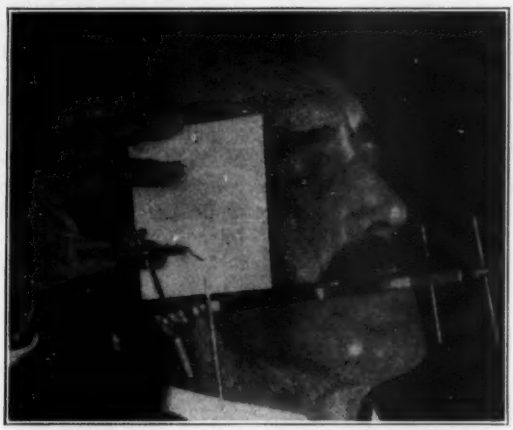


Fig. 8.—Extra-oral graphic method for recording sagittal inclination of condyle path. (Gysi.)

Fig. 9.—Gysi facebow with registering points in relationship to condyles; showing that mandible and facebow move as unit. (Gysi.)

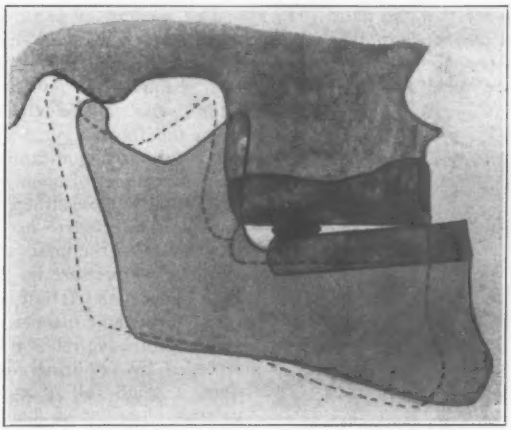


Fig. 10.—Christensen intra-oral registration method of recording protrusive relationship with wax or compound check-bites. (Gysi.)

Fig. 11.—Sears trivet for recording vertical changes in elevation in various positional relations. (Simpson.)

technic are: (1) to see that the patient registers a true lateral position imprint without any protrusive component being introduced. . . . (2) to secure these records without exertion of enough force to unseat the registration plates.

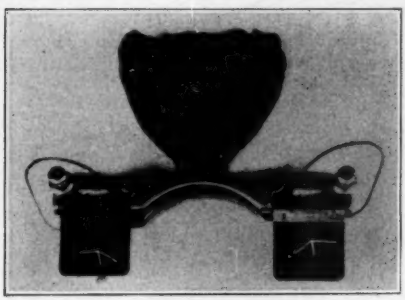


Fig. 12.—Sears trivet; showing dual extraoral registration of gothic arch. (Simpson.)

The method of securing the lateral bite registration consists in introducing a small roll of compound between the occlusion rims, then requiring the patient to shift the mandible to the right or left lateral position and when the tracing pin, by its relation above the gothic arch, indicates a true lateral occlusion position, of about 5 mm., the patient is directed to close straight upward. . . . The patient is directed to exert a small amount of pressure on the masticating side only; and to make no pressure on the balancing side. Both right and left lateral registrations are taken in the same manner.

The protrusive relation of the mandible is recorded by requiring the patient to close upon a small roll of compound when the protrusive position of about 5 mm. is reached. It is advisable to register this relation with the anterior edges of the occlusion rims separated about 2.5 mm. or the equivalent of an average depth of overbite. Following the

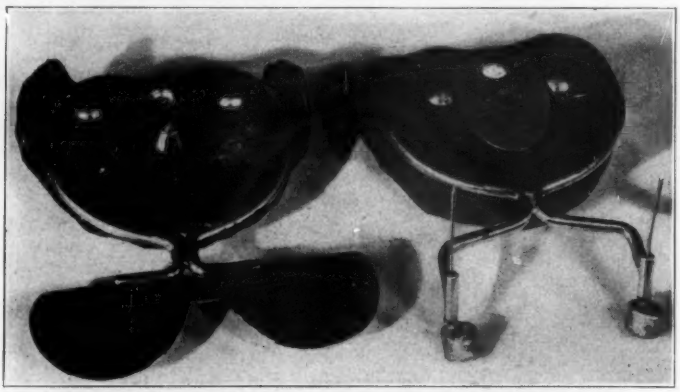


Fig. 13.—Terrell tracing appliances. (Simpson.)

Fig. 14.—Method of raising contact screw in lower registration plate 1.5 mm. (1½ turns) to accommodate cusp height in lateral excursion. (Stansbery.)

registration of the protrusive and lateral occlusion contact positions, a face-bow record is taken. . . .

DUAL EXTRA-ORAL METHOD

The third method of securing positional relations, suggested by Phillips, Sears and Terrell, is a dual extra-oral method, which records the vertical changes in elevation in the various positional relations. (Figs. 11, 12, 13.)

INTRA-ORAL CHECK-BITE METHOD WITH PLASTER

The fourth method of securing positional relation records is the intra-oral check-bite method with plaster. Gysi[7] says "The only really scientific check-bite method I know is the Kanouse-Phillips method as used by Stansbery."

Hall,[8] in describing the methods of registering the positional relations of the mandible, states:

. . . Stansbery . . . is the author of the method recommended for registering positional relations of the mandible. This method is by far the most scientific, practical and accurate of all yet devised. It is the first to take cognizance of the opening movement (depth of the cusps and overbite) registering eccentric relations of the edentulous mandible that obtain when the teeth are inserted.

In describing this technic, it should be understood that the preliminary step is the recording of the correct vertical dimension (or available denture space) and the registration of centric relation. After these steps, the casts are mounted on a plain line articulator. For a description of the technic, I quote from an article by Stansbery.[9]

After the removal of the centric plaster check-bite the screw in the lower registration plate is raised 1¼ turns, the plates being separated 1.5 mm. beyond that of centric. (Fig. 14.) The registration plates are now replaced in the patient's mouth and the patient is instructed to move laterally to the right and then to the left in the same manner as was used for obtaining the tracings for centric. . . . The plates are removed from the mouth, and from the apex of this new tracing one measures 6 mm. (one-fourth inch) on each line, and with a sharp pointed instrument the 6 mm. position is indicated. (Fig. 15.) At this time one should also complete the diamond shaped figures on the graph

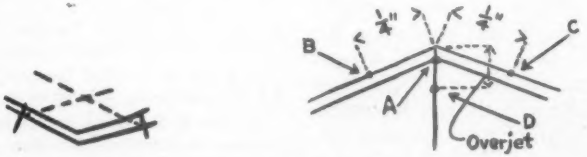


Fig. 15.—Diagrammatic view of graph plate tracing. B and C are recorded 6 mm., or one-fourth inch, from apex of gothic arch, in functional relationship. (Stansbery.)

Fig. 16.—Left: Plaster being injected for right functional occlusion check-bite; showing position of stylus on graph plate. Right: Set of check-bites, two upper viewed from under side, and right and left check-bites viewed from upper side; showing stud arrangement. (Stansbery.)

plate by drawing lines BD and CD. The appliances are replaced in the mouth and the patient moves laterally toward the right or left until the style point rests on the 6 mm. mark just made. The patient is instructed to hold this position firmly with moderate biting pressure while the plaster is injected between the plates as described for the centric check-bite. [The same procedure is followed to register the opposite check-bite, that of the right or left relation.] For the protrusive bite the mandible is moved forward until the pin rests at point D and the plaster is injected as for the previous check-bites. (Fig. 16.)

This summary of methods used to record centric and other positional relations must not be accepted as final. A satisfactory solution of this complex problem will be attained only when the articulator has been established beyond scientific and practical questioning. Those who are familiar with the developmental stage in which this phase of denture construction at present finds itself know that there is still much investigation to be carried out and many final decisions to be made.

The average practitioner, unless he is learned in the more obscure phases of physics and mathematics, to say nothing of the physiology and anatomy of the human jaws, will do well to employ one of the methods that have been described here and learn to cope with its variations in individual cases. By doing this, the practitioner will be achieving what is after all the end of all theorizing about denture construction: the construction of useful, esthetic and functional dentures.

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1757 West Harrison St.

METHODS OF SECURING CENTRIC RELATION AND OTHER POSITIONAL RECORDS IN COMPLETE DENTURE PROSTHESIS

By EARLE S. SMITH,* D.D.S., Iowa City, Iowa

OF the various phases of prosthetic work, the one which seems to captivate the crowd in a clinic room is a demonstration on impressions. Impression work is interesting and it is important. Nevertheless, the planning and the building of the superstructure for a denture is as important as laying the foundation.

Failure to recognize this fact is often the basis of wrong interpretation in diagnosing the complaint of the returning patient. Unequalized pressure, faulty intercusping of teeth, tripping of cusps and stretching the muscles too far or not enough are often overlooked. Instead, the base of the denture is carefully inspected, it is trimmed here, it is trimmed there and finally, in desperation, the entire inner surface is cut out and the denture is rebased. Yet, all of this time, the trouble may have been in the superstructure rather than in the foundation area, and the patient continues to return.

Hasty, slipshod, inaccurate records are expensive, requiring makeovers, which involve the expenditure of extra time and money by the operator, to say nothing of disappointment and dissatisfaction on the part of the patient.

The determination of centric relation is rightly considered one of the most important steps in the construction of a denture. This process has been described as establishing both condyles in a retruded rest position in their sockets while the mandible is at the accepted degree of opening; from which position, unstrained lateral excursions of the mandible must still be possible.

Since the centric record is dependent on the vertical dimension, the determination of vertical dimension properly precedes that of centric relation. Accuracy in both these records is necessary if comfort, pleasing appearance, clear enunciation and mechanical efficiency are to be provided the patient.

If, for the vertical dimension record, an inadequate amount of space is provided—closed bite—loss in muscular power and marked changes in facial expression will occur. The muscles of mastication and of facial expression are shortened, the anatomic angulation between their points of origin and insertion is changed, and they are unable to exert their maximum tension. This decreased tension, in turn, causes them to lose tone just as any muscle tissue does when it is not sufficiently exercised. The lips fold inward, furrows and wrinkles are formed and the face becomes prematurely old in appearance.

On the other hand, increasing the vertical dimension beyond the physiologic limit of the muscles—open bite—also results in a decrease in masticatory power. The muscles are in a continual state of

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strain. The patient has a feeling of discomfort, the cause of which he finds hard to analyze. During speech, the teeth of the opposing dentures make contact sooner than the wearer expects and clattering results. The patient may have difficulty in separating the dentures sufficiently for an average bite of food; and in persons other than those with long, flexible lips, the expression is one of strain. Patients who have had a "closed bite" will be uncomfortable and the facial expression will appear somewhat strained for a time when the jaws are first placed at the proper degree of opening. However, in a short time, these will adjust themselves, but if the bite has been unduly opened, they never become adjusted.

Fig. 1.—Notch cut in lower bite-rim to establish occlusal plane level in region of lower central incisors after establishment of occlusal plane on upper bite-rim.

Fig. 2.—Excess wax removed upward and backward from the notch, lower bite-rim being left high posteriorly.

Since facial expression is an important factor in determining the accuracy of the vertical dimension record, the operator may with benefit take into consideration the type of upper lip with which he is dealing.

1. The short lip is characterized by firmness and the edge when relaxed is on an approximate level with the alveolar ridge. In smiling, laughing and talking, it is raised to a level such that much of the alveolar ridge is brought into view.

2. The long lip is characterized by marked flexibility and the edge of the lip when the lip is relaxed and even when raised in laughing is on a level lower than the alveolar ridge. Persons with this type of lip keep their natural teeth well covered and, even in laughing, show little, if any, of the labial surfaces.

3. The intermediate type is characterized by a moderate degree of firmness and a moderate degree of exposure of the teeth during speech.

The long, flexible lip, owing to the ease with which it can be made to cover the labial aspect of a denture, presents one of the hardest problems in determining vertical dimension and especially in avoiding "opening the bite."

One often hears the remark that the occlusal plane should be so many millimeters below the level of the upper lip. There is no "rule of thumb" method applicable to all cases. While 2 mm. below the level of the upper lip may be acceptable for the intermediate type, for the short lip the level must be lower, and for the long lip it must be placed higher and hidden.

The accompanying illustrations show a simple, effective method of establishing occlusal planes on upper and lower wax rims. By the method shown, the contact of the wax of the two bite-rims will be more complete and more nearly uniform and the distribution of pressure on the supporting structures will be more nearly

equalized than by trimming a lower bite-rim with a knife. (Figs. 1, 2 and 3.)

In determining the accuracy of the vertical dimension record, the operator must depend largely on his judgment. He may take into consideration (1) the strained or unstrained appearance of the lips; (2) comparison of the length of the thirds of the face; (3) the results of phonetic tests, and (4) the degree of effort exerted in opening the mouth sufficiently to take a bite of food. While these tests are useful, there are no empiric tests which are infallible. Nature never intended the thirds of some faces to be equal. Certain persons never open their lips to any extent in talking, and the long flexible lip may not give the appearance of strain even though the jaws are separated too much.

Fig. 3.—Wax on lower bite-rim pooled deeply and uniformly except in region of lower incisors. When seated in the patient's mouth, the upper and lower bite-rims will make contact posteriorly, but will be separated anteriorly. The patient forms the occlusal plane on the lower bite-rims by closing until bite-rims contact anteriorly.

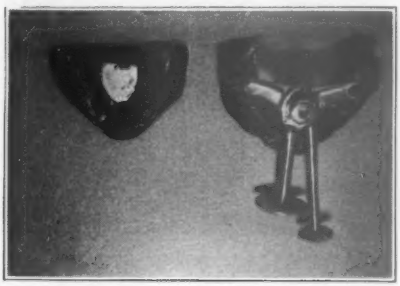

Fig. 4.—Boos bimeter mounted on lower bite-rim; central bearing plate in vault area of upper.

It was not until about a year and a half ago that an instrument was introduced as a means of determining vertical dimension. The premise upon which the instrument is based is the possibility that maximum biting power may be used as a gage in determining this dimension. To Ralph Boos, of Minneapolis, belongs the credit for this contribution.

Similar in some respects to a gnathodynamometer, the instrument is attached to a lower baseplate and so located that it will act as a central bearing point against a smooth, hard metal plate embedded horizontally in the vault area of an upper baseplate. (Fig. 4.) The jaws can be separated to varying degrees by unscrewing the turret that carries the central bearing point. The recording of the amount of pressure being applied is accomplished by a needle on a dial attached to the end of a metal stem which

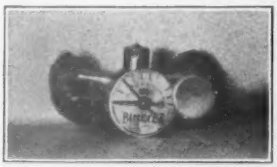

Fig. 5.—Dial on bimeter to indicate biting pressure.

Fig. 6.—Recording with plaster the degree of opening, when attained.

extends forward out of the mouth when the apparatus is in place. (Fig. 5.)

Starting with a closed-bite relation, recordings are made at different degrees until an opening between the jaws is reached at which maximum biting pressure is attained. From this position, the opening between the jaws is closed 1.5 mm. to 2.5 mm. The theory upon which this procedure is based is that the separation of the jaws at which the muscles

Fig. 7.—Stylus mounted on labial aspect of upper bite-rim; tracing table, mounted on lower bite-rim.

Fig. 8.—Vertical dimension maintained by bite-rims. Although the tracing will be in full view, the contacting bite-rims are an interfering factor in making mandibular movements.

are able to exert maximum pressure indicates that the physiologic working limit of the muscles has been reached and that a closure of 1.5 to 2.5 mm. from this position gives them a position for physiologic rest. (Fig. 6.)

Our experience with this instrument has been that as the bite is opened, the pressure recordings gradually increase for a time, then remain about the same and then begin to drop. Our assumption has been that the degree of separation of the jaws when maximum pressure is first registered—in other words, when the pressure curve begins to level off—is the one from which to determine the physiologic rest position. At present, our work with the instrument is of an investigative

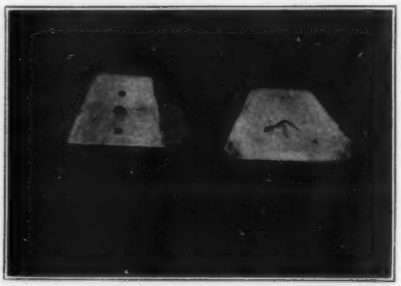

Fig. 9.—Central bearing plates, one of which carries a pointed screw to maintain vertical dimension and to serve as a stylus. The objectionable feature of this method is the fact that the tracing will be hidden from view when the bite-rims are in the mouth.

Fig. 10.—Combination of extra-oral tracing device and central bearing plates. Vertical dimension is maintained by central bearing plates. The bite-rims are not in contact, and free mandibular movements are possible.

nature. Its use has been of material assistance in two cases recently, in determining that too great jaw separation was the source of trouble. Whether it will meet all requirements for the determination of vertical dimension re-

mains to be seen, but at least it seems to be a step in the right direction in arriving at a scientific basis for the determination of a difficult record.

The degree of separation having been determined, the principal problem in taking the centric relation record is to know when the heads of the condyles are in the most retrusive position in the fossae from which unstrained lateral movements can be made. Many methods of procedure and testing have been advocated—the tip of the tongue in the back part of the vault of the mouth during closing, relaxation of the jaw muscles during closure and chin restraining devices—but of all methods, the arrow-point tracing is the only one that is uniformly dependable. In fact, when centric relation records are based on procedures other than arrow-point tracings, it is questionable whether more than 50 per cent are correct. This figure seemed too high until we required our students to take two types of records, one based on empiric tests and one based on a tracing for each of their denture patients, and we found that more than half of those taken empirically were faulty.

In mentioning arrow-point or gothic arch tracings, one realizes that he is faced with prejudice and preconceived ideas that these records are too intricate to understand and too laborious to make. This misconception is undoubtedly based on the bewilderment often engendered by so-called scientific arguments over hair-splitting points. Taking dependable records is really a simple procedure and one which can be easily grasped.

An illustration similar to one given by Victor H. Sears may serve to clarify the

Fig. 11.—Parts carrying stylus and tracing table extending forward out of mouth. The tracing will be in full view of the operator.

Fig. 12.—Arrow-point tracing.

Fig. 13.—Plaster as recording material is injected, with point of stylus resting in apex of arrow-point tracing.

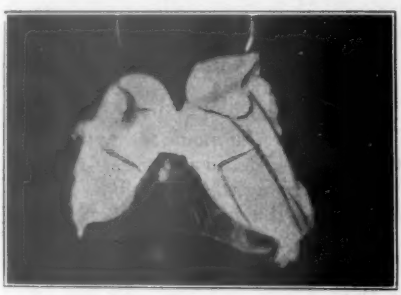

Fig. 14.—Plaster record.

principle upon which the tracing method for the determination of centric relation is based. A strip of wood is nailed to the top of the table so that it projects 2 inches above the surface. With the two hands grasping a piece of cardboard, the forearms are rested on the table-top with both elbows against the strip of wood. The strip limits the backward movement of the elbows; that is, they are in their most retrusive position. The forearms are in centric relation.

If the cardboard is held in a horizontal position beneath and in contact with a pencil fixed in a perpendicular position, the cardboard will represent a table attached to a lower bite-rim, upon which a tracing can be made; the pencil, a stylus attached to an upper bite-rim.

While keeping the right elbow in position against the strip of wood, the forearms are moved to the right, rotating about the right elbow. The forearms are in right lateral relation. An arc of a circle will be scribed on the cardboard.

The process is reversed by keeping the left elbow in position and moving the forearms to the left. The forearms will be in left lateral relation. A second arc will be scribed on the cardboard, intersecting the first arc to form an arrow-point. The point of intersection is the point upon which the pencil rested in starting each arc. But at the point of starting, the elbows were both against the strip of wood. Therefore, when the pencil rests over the apex of the arrow-point tracing, the elbows are in their most retruded position or the position for centric relation.

Thus, in the mouth, when the tracing needle lies exactly at the apex of a sharp, definite, arrow-point tracing, we can assume that the condyles are in their most retruded position and the mandible is in centric relation.

To make a tracing record for centric relation, there are four requirements: (1) a tracing table attached to one trial base and a stylus attached to the other; (2) a means of maintaining vertical dimension; (3) a means of recording the relation when once the tracing is made, and (4) equal distribution of pressure on the supporting tissues.

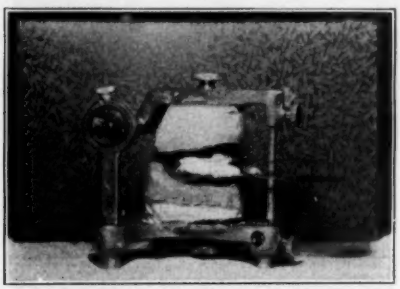

Fig. 15.—Lower cast mounted by means of plaster record.

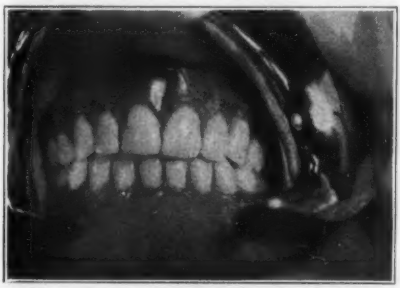

Fig. 16.—Completed dentures; centric occlusion.

In meeting the foregoing requirements, there are three methods in general use. In one, the tracing table and stylus are attached to the labial surfaces of the bite-rims to extend forward out of the mouth. (Fig. 7.) Vertical dimension is maintained by the contacting bite-rims. The drawbacks of this method are that the contacting surfaces of the bite-rims will not glide easily upon each other, horizontal stresses are set up and shifting of the bases may easily occur, and, under these conditions, it is difficult for the patient to make accurate recordings. (Fig. 8.)

Maintenance of vertical dimension by a single point rather than by surface contact is preferable. This can be accomplished in a second method by means of flat metal plates impressed into the bite-rims sufficiently that a space one-eighth to one-quarter inch between the metal plates can be maintained by a pointed screw fitted into the center of one of the plates. (Fig. 9.) With this means of maintaining vertical dimension, the mandibular rim can be cut down sufficiently to bring it out of contact with the maxillary rim, thus permitting a more nearly equalized pressure on the supporting tissues, making possible easier mandibular movements and also providing a space into which plaster may be injected to maintain the relation when once it has been found. However, this method has the disadvantage in that the central bearing point also serves as the stylus in making the tracing and, located as it is in the central or mouth area, the tracing is hidden from view and the operator is "in the dark" when ready to apply the recording material. Also, more lateral stresses will be produced if the central bearing point is a sharp rather than a rounded point, and especially is this true if a depression is countersunk into the metal plate to aid in maintaining the relationship.

In a third method, the good features of the two preceding methods are utilized. A rounded central bearing point maintains vertical dimension. The tracing is made extra-orally, and since it is in full view, there is no necessity for countersinking a depression. (Figs. 10, 11 and 12.) The use of plaster as the recording material has advantages in that it introduces no new stresses when being applied and the resulting record has fine detail and is not easily distorted. (Figs. 13, 14 and 15.)

Centric relation is fundamental to all jaw movements and is thus of primary importance. If it is inaccurately recorded, the inaccuracy is reflected by faulty occlusion, tripping and interference of cusps, trauma and discomfort.

In closing, may I reiterate that a little more time and a little more care spent in taking jaw relationship records are more than recompensed to the operator by the need for fewer adjustments and fewer makeovers, and to the patient by greater comfort and greater denture efficiency. (Figs. 16, 17 and 18.)

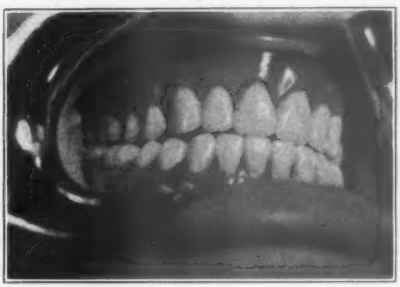

Fig. 17.—Completed dentures; protrusive occlusion.

Fig. 18.—Completed dentures; left lateral occlusion.

A SIMPLE COLORIMETRIC METHOD FOR THE DIAGNOSIS OF CARIES ACTIVITY

By MARSHALL L. SNYDER, Ph.D., Ann Arbor, Mich.

THE use of a simple colorimetric method[1] for the diagnosis of caries activity is described for ordinary clinical use by the practicing dentist. Based on the rate of color change in a selective agar medium (pH 4.7-5.0), it requires only a few pipets and an incubator to give results in forty-eight hours which compare favorably with those obtained by the quantitative estimation of lactobacilli in the saliva.[2, 3] Since the latter technic requires at least four days and is almost entirely limited to the bacteriologic laboratory, the advantages of a colorimetric test in speed, economy and accuracy are obvious. Evidence that the colorimetric method is satisfactory for the diagnosis of caries activity was secured by culturing, periodically over thirteen months, with both procedures, the saliva of sixty-three young children and comparing the results with clinical examinations at the beginning, middle and end of this period. The present paper embodies the data of study.

MATERIAL AND METHODS

Most of the sixty-three children tested were in the kindergarten and first, second, and third grades of the University Elementary School and of an average of 5-8 years. They were selected for two reasons: 1. The incidence of caries is less with younger children. 2. Many remain six years in the school and are given routine dental and x-ray examination. These conditions permit a longitudinal study with a small number of subjects about whom detailed information is available.

Specimens of saliva were obtained by having the children chew paraffin tablets for three minutes, during which time the saliva was collected in sterile test tubes or bottles. Collections were made from 8:15 to 9:30 a.m. at approximately monthly intervals, interrupted once by illness and once by the summer vacation. A maximum of nine specimens were secured from any one child, the average being between six and seven. A few of the recent inclusions had only two or three tests recorded.

The specimens of saliva were taken to the laboratory, where they were shaken vigorously before variable amounts (0.1-0.2 cc.) were added directly to tubes of melted medium at 45° C. The respective tubes were then solidified and incubated for four days, with daily observations. At first, both lactose and dextrose infusion agar (pH 5.0) containing bromcresol green as the indicator were used. The results indicated that dextrose was more reliable than lactose and that 0.2 cc. of saliva was the optimum amount for use in inoculation. Later, a specially prepared dextrose-agar medium* was found better than the others tested and is now routinely employed with 0.2 cc. of saliva as the standard inoculum. The color reactions induced by bacterial action range from no alteration of the bluish green

From the Hygienic Laboratory, University of Michigan.

*This medium can be obtained from the Difco Laboratories, Detroit, Mich., in dehydrated form or already prepared in screw-top tubes under the name bromcresol-green dextrose agar.

color through stages to a distinct yellow. Alterations were arbitrarily estimated and only those recorded as 3 or 4, in which green was no longer the dominant color and which were readily distinguished from uninoculated controls, were considered significant.

For the purpose of estimating the lactobacillus content of the saliva, 0.1-0.2 cc. of the specimens of saliva were placed on tomato juice-agar plates (pH 4.8-5.0) and smeared by means of sterile bent glass rods. A larger quantity (0.6-0.8 cc.) was inoculated into acid-glucose broth in a qualitative test for the presence or absence in forty-eight hours of gram-positive rods considered to be lactobacilli. After ninety-six hours, the plates were examined for characteristic colonies of lactobacilli and other aciduric types, the numbers of which were estimated by the aid of a binocular dissecting microscope. Thus, a comparison was made between the colorimetric test and quantitative lactobacillus counts as methods for the diagnosis of caries activity.

From previous experience, it was learned that positive color reactions in forty-eight hours are significant, and, in the present study, the diagnosis of caries activity was made in respect to the colorimetric test on the following basis:

No color change in 96 hours: no activity.

Positive color reaction in 48-96 hours: slight activity.

Positive color reaction in 24-48 hours: definite activity.

Positive reaction in 12-24 hours: marked activity.

In a similar way, caries activity was estimated by absence of or a rise and fall in numbers of lactobacilli in the saliva. Both methods are limited by the fact that a single bacteriologic examination is not sufficient to indicate whether caries is active or not. A positive or negative diagnosis must depend on repeated tests at intervals to rule out chance findings. On this basis, sporadically positive or negative results are eliminated.

RESULTS

The sixty-three children were divided on the basis of summation of clinical activity in the following manner: a negative group of twenty-three children who showed neither cavities nor fillings, an active group of twenty-three children in whom there was a definite increase in the numbers of cavities and fillings and a group of seventeen children whose clinical status was questionable. The clinically questionable individuals included those subjects in whom doubtful areas were found or in whom there was little or no change in numbers of previously recorded cavities or fillings. The diagnosis of caries activity by colorimetric tests and quantitative lactobacillus counts is compared with the clinical conditions of these three groups in Table 1.

TABLE 1.—COMPARISON OF LABORATORY AND CLINICAL DIAGNOSES OF CARIES ACTIVITY IN SIXTY-THREE YOUNG CHILDREN

Clinical Diagnosis of Caries Activity	No. Children	Laboratory Diagnosis of Caries Activity					
		Negative		Questionable		Active	
		Color	Lacto-bacilli	Color	Lacto-bacilli	Color	Lacto-bacilli
Negative	23	22	21	0	1	1	1
Questionable	17	13	11	2	4	2	2
Active	23	0	2	3	2	20	19

Table 1 shows that of the twenty-three cases found to be clinically negative, only one was estimated to be caries active by both laboratory methods, while frequent cultures of lactobacilli, although in low numbers, made the diagnosis questionable in another case by the quantitative procedure. In the clinically questionable group, both cultural technics indicated the same two cases as caries-active, but only two questionable estimates were made by the colorimetric tests instead of four by lactobacillus counts. On the whole, the colorimetric method separated the children into distinct groups more easily than lactobacillus counts, since it was easier to interpret either consistent or intermittent positive or negative color reactions than varying numbers of lactobacilli.

Although a past history of caries activity placed many children in the clinically questionable group, there were twenty-three subjects in whom definite increases in numbers of cavities and fillings could be determined. In this group, the color test indicated twenty cases to be caries-active and three questionable, while lactobacillus counts indicated nineteen as active, two questionable and two caries-negative. These results would suggest that the colorimetric method was more accurate than lactobacillus counts in diagnosing caries activity, but more recent findings (unpublished) establish the two methods as of about equal efficacy.

However, acceptance of the colorimetric method for diagnosing caries activity involves not only the practical considerations of simplicity, accuracy and economy, but also the idea that acidogenic or aciduric organisms other than lactobacilli have some share in the process. Thus, instead of narrowing the etiology to one species or type, there would be the broader concept of acid production irrespective of numbers or species; but, in this study as in an earlier one,[5] the only correlation between the presence and numbers of aciduric or acidogenic bacteria in the saliva and caries activity was that which was found with the lactobacilli and yeasts. Neither streptococci nor staphylococci were isolated any more frequently in the caries-active than the caries-negative cases.

TABLE 2.—COMPARISON OF INCIDENCE OF LACTOBACILLI AND YEAST IN SPECIMENS OF SALIVA WITH ACID PRODUCTION IN BROMCRESOL GREEN-DEXTROSE-AGAR (pH 4.75) INOCULATED WITH 0.2 CC. SALIVA

Summation of Clinical Activity	No. Children	No. Specimens	No. Lactobacilli	No. Yeast Organisms	Positive Color Reactions (Hours)			
					24	48	72	96
Negative	23	89	9	3	0	3	10	14
Questionable	17	78	16	4	2	8	14	16
Active	23	106	96	12	34	88	101	102

Because variable amounts of saliva were inoculated into different carbohydrate media in the early part of the investigation, the incidence of lactobacilli and yeasts in the specimens of saliva is compared with respective color reactions in Table 2 for only that portion where a single medium, bromcresol green-dextrose-agar was used with a constant inoculum of 0.2 cc. of saliva. Despite the apparent selection of data, there are included a majority of the specimens of saliva and the time intervals over which final diagnoses were made.

Table 2 has several interesting features. The 10 per cent incidence of lactobacilli in the specimens of saliva from the negative group and the 10 per cent absence

from the negative group, instead of being marked exceptions to etiologic relationship, only emphasize more clearly the trend of clinical activity; that is, in any group of cases, some are becoming either caries-active or caries-negative, and the clinical change is reflected in or predictable by the cultural findings.

Yeasts were seldom isolated from the clinically negative group, but their increased presence in the saliva of caries-active cases is such that they cannot be statistically disregarded. Numerically, it is apparent that their rôle is a secondary one, but their influence on acid production is important in view of the work of Fosdick and Hansen,[6] who have shown that the yield of lactic acid in cultures of lactobacilli is greatly enhanced by the addition of yeast. They explain this synergy on the basis that lactobacilli are rich in reductase, but deficient in phosphatase, which is essential for the beginning degradation of carbohydrate and is furnished by the yeast.[7] Whatever the action *in vivo*, there is, in respect to acid production in the test tube, a critical time interval between forty-eight and seventy-two hours before which positive color reactions are of much significance, but after which they add little to the diagnosis of caries activity.

To emphasize further the predominant rôle of lactobacilli in dental caries, it is interesting to compare in Table 3 their numbers in the same specimens of saliva as listed in Table 2 with the respective color reactions.

It is very obvious in Table 3 that not only do lactobacilli appear more frequently in the active than in the negative and questionable groups, but also the average number increases. Color reactions also appeared much more quickly in the active than in the negative group. The time differentials served to pick out the most active cases. As already noted, these changes cannot be attributed solely to numbers of lactobacilli, but must also be recognized as due to the presence or

TABLE 3.—COMPARISON OF FREQUENCY AND TIME OF COLOR CHANGE IN BROMCRESOL GREEN-DEXTROSE-AGAR WITH LACTOBACILLUS COUNTS IN RESPECTIVE SPECIMENS OF SALIVA

No. Children	Summation of Caries Activity	Lactobacillus Counts	No. Specimens	Color Change (Hours)			
				24	48	72	96
23	Negative	0	80	0	0	1	5
		0–100	4	0	0	4	4
		100–1,000	4	0	3	4	4
		1,000–10,000	1	0	0	1	1
		Total	89	0	3	10	14
17	Questionable	0	62	0	0	0	1
		0–100	5	0	0	4	5
		100–1,000	2	0	1	2	2
		1,000–10,000	5	0	5	5	5
		10,000–100,000	4	2	2	3	3
		Total	78	2	8	14	16
23	Active	0	10	0	4	7	8
		0–100	2	0	1	2	2
		100–1,000	11	0	6	10	10
		1,000–10,000	36	7	33	36	36
		10,000–100,000	36	16	34	35	35
		100,000–1,000,000	11	11	11	11	11
		Total	106	34	88	101	102

absence of acid formation regardless of numbers of lactobacillus or their morphologic types or other aciduric organisms.

COMMENT

Of two laboratory methods used for the diagnosis of caries activity as measured by the clinical history of the individual cases, the first, or quantitative method, was that which estimated numbers of lactobacilli in the saliva as an index of caries activity. With this procedure, it is possible to demonstrate a consistent relationship between the presence or absence of lactobacilli, as expressed by high, medium, low and negative counts and the state of caries activity. However, there are many objections to the method, both bacteriologic and interpretative. It is almost needless to say that any attempt to evaluate accurate bacterial counts from a material so variable in chemical and biologic makeup as saliva, for which there are as yet no accurately defined normal limits, and cultured on a medium difficult to standardize, is open to all the errors inherent in plating methods. Also, plate counts, while distinguishing the morphologic types of lactobacilli, do not take into consideration either the acid production of these respective types[8] or the influence by other organisms on this acid production.[9, 10, 11]

The colorimetric test was developed from an attempt to simplify the quantitative technic for ordinary clinical use. It reflects the acid production of all the organisms of the saliva inoculated in the selective carbohydrate medium (pH 4.7-5.0). Since the Millerian concept[12] of dental caries is based on the action of acid derived from bacterial fermentation of carbohydrate, it was suggested that by this color test reflecting acid formation as a whole, irrespective of numbers or species of bacteria, it should be possible to detect caries activity easily, quickly and accurately. This possibility was demonstrated after a thirteen months' study of sixty-three young children.

This simple method for the diagnosis of caries activity requires a relatively small amount of equipment. A few pipets and an incubator furnish the means for any dentist to determine easily, accurately and economically whether caries is active or not and, to some extent, the degree of activity. Its application would seem to be especially useful in the fields of orthodontia, in preventive dentistry for children and in public health surveys. At present, the test is apparently too insensitive for use in following effects of diet therapy on control of caries activity, but this possibility is being further investigated.

SUMMARY

A simple colorimetric test based on acid production in a selective carbohydrate medium (pH 5.0) can be used as a means of diagnosing caries activity. In a group of sixty-three young children, it was possible to select very accurately the caries-active and caries-negative cases as established by clinical examination.

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THE RÔLE OF NITROUS OXIDE-OXYGEN ANESTHESIA IN THE OFFICE OF THE GENERAL PRACTITIONER

By HARRY M. SELDIN,* D.D.S., New York, N. Y.

GENERAL as well as local anesthesia has its definite place in mouth surgery. The trained anesthetist can induce and maintain a smooth, even and pleasant narcosis with nitrous oxide-oxygen for as long a period as may be required for the completion of any complicated oral surgical procedure. General anesthesia is especially desirable:

1. In the presence of acute infection.
2. Where the site of the needle puncture is infected: i.e., pericoronal infection of mandibular third molar.
3. When pericemental inflammation prevents the action of local anesthesia.
4. In operations on very young children.
5. For apprehensive and uncooperative adults.
6. For multiple extractions.

It must be borne in mind, however, that the individual submitting himself for surgical procedures under general anesthesia depends upon the skill and judgment of the anesthetist to guide him safely back to consciousness from the narcosis. It is in the hands of the anesthetist that the balance between life and death is often placed. It becomes obvious, then, that the gas machine should not be considered as a toy, nor a human life as a plaything, and that not only should the dentist be thoroughly trained in the art of anesthesia, but he should possess in his office the proper physical set-up and personnel before he attempts surgical procedures under a general anesthetic. No one, no matter how well trained, can act as anesthetist, surgeon and assistant at the same time, and still do justice to his patient. It is possible to make the average routine extractions under gas-oxygen narcosis with just one assistant who is an experienced anesthetist. However, it takes a team of three—anesthetist, operator and assistant—to handle major surgery, and the complications that might follow in routine exodontia.

Self-confidence is a virtue; overconfidence, however, ceases to be a virtue and might prove even to be a serious detriment. The dentist should select for general anesthesia only those patients who he is certain can be successfully managed by himself and his staff. The patient will not think too well of the dentist who at-

*Consulting Oral Surgeon, Harlem Hospital.

Read before the Section on Oral Surgery, Exodontia and Anesthesia at the Eighty-First Annual Session of the American Dental Association, Milwaukee, Wis.

tempts a surgical procedure under a general anesthetic, only to have to finish it under a local anesthetic.

Knowledge of the types of patients to be anesthetized will prevent considerable embarrassment. Patients may be classified roughly into three different groups:

1. Resistant types (such as alcoholics, athletes, etc.).
2. Normal types.
3. Debilitated types.

The difficulties usually encountered with the resistant types under nitrous oxide are caused by adding oxygen too soon, and in too high a percentage, thus bringing the patient into the excitement stage. Considerable time is required to level these individuals into the desired plane. The resistant types present several further complications:

a. The physical harm they may do to themselves, the operator, or the equipment.

b. The possibility of a sudden change from the excitement stage into the fourth stage, followed by respiratory failure.

When the body is subjected to marked physical exertion, the intake of oxygen and the output of carbon dioxide may be ten times greater than when the body is at rest. The patient during induction receives little or no oxygen; then, should the patient struggle during the excitement stage, the reserve oxygen in the body would be rapidly used up. Add to this the fact that the increased output of carbon dioxide pumps the tissues dry of this respiratory stimulant. Lacking a sufficient supply of oxygen, as well as of carbon dioxide, the patient quickly passes into a state of exhaustion and respiratory failure.

The resistant types may be handled more successfully and more readily when premedicated. Premedication reduces the tissue demand for oxygen and raises the margin of irritability of the vital centers. Drugs of choice for premedication are:

1. Morphine, ¼ grain.
2. Nembutal, 1½ grain.
3. Chloratone, 10 to 15 grains.

Premedication is best given 30 to 45 minutes prior to induction. It is obvious that a patient who has been premedicated should have a companion with him to guide him home.

In connection with the resistant type, it must be especially pointed out that they may become cyanotic before fully anesthetized, and the color sign, therefore, is not a reliable sign in such subjects.

The normal types of patients present no difficulties, and they constitute the vast majority of our clientele. These individuals can and should be carried in the light plane of the surgical stage. They should never be saturated into deep narcosis: all that is necessary is to have them quiet and free from pain. The deeper a patient is carried, the less ambulatory he will be. Anesthetic shock is in proportion to the depth and duration of the depth of narcosis.

The debilitated types, such as cardiacs, anemics, pregnancies, etc., must be handled very gently. These patients go into anesthetic shock readily, are subject to nausea and often experience considerable postanesthetic malaise, even under light anesthesia. The anesthetic should, therefore, never be forced or crowded with these types. They are very sensitive to oxygen want, and consequently will require considerably more oxygen than the normal patient. Oxygen must be added early and in sufficient quantity to prevent deep narcosis.

Anemic patients give no evidence of cyanosis, even under deep anesthesia. The color sign of anesthesia cannot be relied upon when anesthetizing such patients. Slow and careful induction and light maintenance are indicated with all debilitated types.

Children have a high metabolic rate, consuming oxygen rapidly and consequently presenting an increased demand for oxygen. Sudden oxygen deprivation

in children will therefore result in marked muscular spasms or twitching. These symptoms can be corrected by adding or increasing oxygen.

There are no mysteries connected with the administration of nitrous oxide and oxygen anesthesia; however, certain essentials must be carried out in order to attain success. These essentials are:

1. Selection of the type of patient and type of surgery in accordance with the operator's experience and physical set-up of his office.
2. Preparation of the patient mentally and physically.
3. Familiarity with the apparatus and knowledge of administration.
4. Knowledge of possible emergencies, and how to cope with them.

SELECTION OF PATIENT

The novice in gas-oxygen administration should select for his subjects only the normal types of patient, and should definitely avoid the resistant types. He should start administering anesthetics only for simple extractions, and as knowledge and experience are gained, gradually attempt operations requiring an increase in the duration of anesthesia. Confidence will come with experience.

PREPARATION OF THE PATIENT

The patient who presents himself to the dentist for the removal of teeth, or other surgical procedures, is often, in addition to being in physical pain and having suffered sleepless nights, in a state of fear and mental anguish. He enters the office nervous and apprehensive, and this anxiety is increased while he awaits his turn in the reception room. He is sent to the lavatory and is then called into the operating room, where he is placed in the chair and draped by a nurse who is often none too gentle or sympathetic. There in the chair he frequently must wait ten minutes or more. These minutes seem hours to him, especially if an array of instruments is spread out before him. When, finally, the dentist does appear, the patient's heart is pounding like a trip-hammer, skipping a beat here and there, and he is on the verge of total collapse.

These nervous, apprehensive patients deserve our sympathy and consideration. It is the duty of the dentist and his nurses to be kind, gentle and considerate, thus lessening the unpleasantness of the situation. Every effort should be made to eliminate fear from the patient's mind. With premedication and a few minutes of preoperative explanation and suggestion, the induction of anesthesia and subsequent surgery can be made tolerable and often even pleasant, rather than a nightmare. The display of instruments to an already tortured mind is little short of barbarism.

Thoughtfulness and consideration will reap not only material reward, but will win the grateful acknowledgment and appreciation of many a patient.

The nervous patient may be premedicated with the same drugs as previously referred to for resistant types.

For the average patient it is best to prohibit the intake of food for about three or four hours prior to administration, with a light meal, rich in sugars, prescribed before the fast. The patient should also be required to empty the bowels and bladder before administration.

KNOWLEDGE OF ADMINISTRATION

The anesthetist should have a thorough knowledge of the apparatus he uses, which should always be tested prior to use. Strict and undivided attention should be paid to all the symptoms of anesthesia. The respirations should be watched and listened to carefully. The exhaling valve will blow off when breathing is correct, and when there are no leaks present. The patient's reaction to the anesthetic are the signs and symptoms of anesthesia, and these reactions

or signs are the only indications by which the anesthetist can be guided for adding oxygen, or increasing or decreasing the oxygen percentage.

Pressure is essential in nasal administration of nitrous oxide and oxygen anesthesia. Pressure is used to build up sufficient gas pressure within the nasal inhaler, so that when the patient inhales, it will be easier for him to breathe the anesthetic through the nose, rather than air through the mouth. The average maintenance pressure is 10 mm. Higher pressure may be indicated for resistant types during induction. As soon as the anesthesia is properly leveled off, the pressure should be reduced to about 10 mm.

With intermittent-flow machines, the gases should flow only during inhalations, the flow ceasing during exhalations. If the gases flow continuously, that is, during exhalations as well as during inhalations of the patient, there is a leak somewhere. The tube may have become detached from the machine, the exhaling valve may be open too wide, the nasal inhaler may not be held tightly enough about the nose, or the mouth may not be properly packed. Ingress of air will greatly hinder administration, and should be guarded against.

Administration is started with 100 per cent nitrous oxide, using 5 mm. pressure. The exhaling valve on the nasal inhaler is kept open for the first eight inhalations, or until the patient begins to lose consciousness. This allows an easy "blow-off" with each respiration, removing all resistance during the exhalations, and thus avoiding the sensation of suffocation. When the patient has lost consciousness, it is evidenced by the following symptoms:

1. Rhythmical, mechanical breathing.
2. Loss of corneal and lash reflex.
3. Eccentric fixation of the eyeball.
4. Pupil small, or medium size.

Eight to twelve per cent oxygen is then added to the mixture, and the pressure is increased to about 10 mm. The exhaling valve is closed in proportion to the pressure employed, thus establishing the rebreathing of about 400 cc. of gases. The rebreathing will conserve the body carbon dioxide for respiratory stimulation, and will afford a considerable saving of the gases.

Induction with oxygen only prolongs the administration, tends to induce excitement and is the cause of many failures, especially in the resistant types. There is no set mixture of nitrous oxide and oxygen that will assure satisfactory induction and maintenance of anesthesia in all persons at all times. To assure success, the anesthetist must determine the minimum percentage of oxygen, as well as the maximum percentage of oxygen, for each patient, and work between these two. The longer a patient is under anesthesia, the more oxygen he will require for smooth maintenance of anesthesia.

As stated previously, pressure is required to exclude air, and as an aid to maintaining an open airway. The pressure required varies with the type of respirations, adequacy of air passage through the nose and the efficiency of the mouth pack. The usual range for induction is from 3 to 5 mm., and it is gradually increased to 10 mm. as maintenance stage is entered. For the average person, 10 to 15 mm. is sufficient; however, in some individuals 20 to 40 mm. may be required. These higher pressures are occasionally needed in a patient with marked nasal obstruction, those with inefficient respiration, and those having deep, quick, boisterous inspirations.

EMERGENCIES

Nausea can be avoided in most instances if the patient has been properly prepared, and a smooth light narcosis is maintained throughout. Nausea during nitrous oxide-oxygen anesthesia is similar to nausea in mountain sickness. In either event it is prolonged oxygen want

which is the cause. A full stomach is conducive to nausea and prolonged abstinence from food will also cause nausea and retching. An uneven and deep anesthesia, as well as the accumulation of blood and mucus in the stomach, will tend to produce vomiting. The early symptoms of nausea are frequent swallowing and a pale greenish color of the skin. This is followed by retching, then vomiting. If the symptoms are noted early, vomiting may be averted by forcing a breath or two of pure oxygen. When vomiting does take place, enough oxygen should be administered to restore the cough reflex, thus preventing the aspiration of vomitus. Consciousness, however, should not be restored. The mouth and throat should be cleared of vomitus and the administration continued. The patient, in many instances, will have no recollection of the occurrence.

Mechanical obstruction of the airway by the accidental passage of a sponge, mouth pack, tooth, blood or vomitus into the larynx or trachea should be carefully guarded against. The correct placement and size of the mouth pack will usually prevent these accidents. However, in spite of all precautions, such incidents do occur, and the anesthetist must be prepared for the emergency. In the event that some foreign body does pass by the mouth pack and descend into the larynx or trachea, oxygen under pressure should be administered immediately. The oxygen is forced past the obstruction and enters the lungs, thus lightening the anesthesia sufficiently to restore the cough reflex. The patient, when the anesthesia is sufficiently light, will cough up the foreign body. It is very doubtful that any foreign body can so completely obstruct the larynx or trachea that oxygen cannot be forced past it. Tracheotomy is therefore rarely if ever indicated. Where the object is too large to be coughed up, a long curved hysterectomy forceps can be used to remove the pack or sponge from its lodging place.

The use of an aspirator will greatly facilitate the removal of blood, mucus or vomitus from the mouth, thus preventing its accumulation in the larynx.

This has been offered as a brief and concise presentation of the essential principles and technic of nitrous oxide-oxygen administration, so far as it relates to the practice of dentistry. The fact must not be overlooked that any type of general anesthesia can be regarded as a temporary suspension of the patient's functional activities between life and death. The outcome is always dependent upon the skill of the anesthetist, and his attentiveness to details and essentials. The dentist who has thoroughly acquainted himself with his apparatus, has mastered the technic of administration and has learned to recognize the signs of the several stages of anesthesia and the danger signals which may present from time to time, and knows his own limitations, may proceed confidently from simple extractions to operations requiring prolonged anesthesia. He may thereby reap the benefits of practice in the wider fields of surgery which a knowledge of general anesthesia permits him to enter, in accordance with his surgical skill and experience.

57 West 57th St.

CLINICAL ASPECTS OF AMALGAM RESTORATION

By Arne F. Romnes,* D.D.S., M.S.D., Chicago, Ill.

THE subject of amalgam is of vital interest among dental practitioners, largely because amalgam is used in the vast majority of restorations, and because it is included in the objective toward which we all strive—prevention. By prevention, I mean the measures by which the cooperative person can be assured of maintaining his natural dentition in a healthy serviceable condition through life. There is no field in dentistry offering greater opportunity for service than that of prevention. The dentist who recognizes this fact, who educates his patients to the present-day conception of preventive measures and follows this with careful operative care, should be, and usually is, rewarded with an appreciative clientele.

The control of caries is still a problem confronting all dentists. The varying opinions of the diet and local environment schools of thought seem now to be converging toward the conclusion that both diet and environment are factors in the general susceptibility to dental caries. Recent outstanding workers in the field of research clearly indicate that caries is directly related to local environmental factors, which, in turn, are influenced by dietary conditions, and that its control may usually be instituted through dietary and local corrective measures.

It is true, however, that, even with the usual cooperation of patient and dentist, carious lesions cannot at present be prevented in a satisfactory number of instances. It remains, then, for the dentist to perform a service which will restore carious teeth to normal function, prevent further recurrence of decay and preserve the pulp and investing tissues.

Amalgam is considered by many good operators second only to gold foil as a restorative material. While it is true that amalgam itself is less expensive than gold, its use in particular types of cavities justifies fees per hour comparable to those charged for gold foil and gold inlay restorations. An amalgam filling is not a cheap means of restoration, as many dentists and most laymen generally believe, but is one of the highest quality if placed with the meticulous care most dentists give to their gold restorations.

Amalgam is a much abused material; but, in spite of its abuse, amalgam saves more teeth than all other filling materials combined. All practitioners time and again remove amalgam fillings that appear broken and leaky, only to find a hardened black dentinal surface or an inactive carious condition. In contrast, when gold inlays in susceptible mouths have failed, the carious process is invariably active and much softened dentin is found. This speaks highly for amalgam since, apparently, its inherent properties retard the carious process and, seemingly, it serves as a somewhat germicidal material. This speaks particularly well for its more extensive and intelligent use, especially if the cavity can be so prepared that success of the restoration is assured.

INDICATIONS AND CONTRAINDICATIONS

Amalgam is indicated in deciduous teeth, where the problem of child man-

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*Assistant professor of operative dentistry, Northwestern University Dental School.

agement necessitates restoration of carious cavities in minimum time and with least discomfort. Certainly, it should be used in preference to cement, because of its greater strength and its ability to maintain proximal contact.

It is particularly indicated in pit and fissure cavities during the young adult period, when, for the most part, it becomes a permanent restoration as far as the requirements of permanency are concerned, and since interproximal caries usually follows, its removal does not involve so much expense. Most observers regard pit and fissure amalgam fillings as second only to gold foil in producing the very best restoration.

The proximal occlusal cavity presents a more difficult problem. Gold inlays afford the opportunity of restoring proper contour and contact. Moreover, their edge strength is very much in their favor. These facts alone speak highly for the use of the gold inlay. Broken-down teeth, wherein cavities are complex and bulk of amalgam can be easily obtained, offer a definite indication for its use. The senile type of caries is usually best managed with amalgam fillings in posterior teeth, since their location does not always allow for convenience in the manipulation of gold. Amalgam is further indicated in persons of the lower income group, since the time consumed and expense involved in its use are less than in gold restorations.

Amalgam is contraindicated in rotated teeth where slice extensions are necessary to include the areas of liability to caries, as well as in all cases where sufficient depth cannot be obtained to allow for proper bulk of the material, and usually in anterior teeth, on account of its tendency to discoloration. Perhaps amalgam should not generally be used in those teeth where a gold clasp of a partial denture makes contact with the filling, since, in my experience at least, nearly all clinical symptoms of shock due to the galvanic reaction of dissimilar metals have been seen in such a condition.

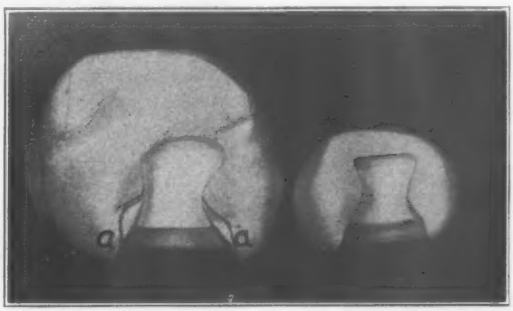

Fig. 1.—Models showing occlusal outline form of Class II cavities for amalgam. The prepared outline in the molar is permissible for gold restorations. However, the acute angle resulting at *a* is undesirable for amalgam owing to its weak edge strength. The corrected outline is indicated by the penciled line. The bicuspid is shown as prepared to assure maximum marginal strength to withstand occlusal stress.

CAVITY PREPARATION

The underlying factors in cavity preparation are alike for all permanent restorative materials as far as they pertain to the usual order of procedure as outlined by Black. However, for each individual material, certain changes are required in cavity preparation to suit the physical properties and manipulative peculiarities.

A correct application of the principle of extension for prevention will afford

little opportunity for the recurrence of caries about the margins of a filling. As the childhood and young adult period are the periods of greatest susceptibility to caries, close attention should be given to the crest of the gingivae in relation to beginning surface involvement. Generally speaking, the younger the person, the greater the necessity for preparing the gingival margin of the cavity beneath the margin of healthy gum tissue. The gradual physiologic recession of the gingivae with advancing age may, within a few years, expose the gingival margin of the filling where it has not been sufficiently extended. This may render the area liable to recurrent caries in the future, if the patient continues to be susceptible to caries. Extension for prevention is further governed by the extent and depth of the fissures,[1] position of the contact, embrasures (buccal, lingual, occlusal, gingival), occlusion and general susceptibility to caries.

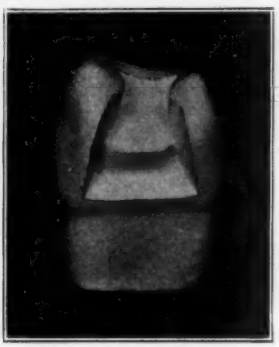

Fig. 2.—Definite resistance and retention forms designed to assure maximum resistance to displacement and stress. Proximal retention is increased by means of retention grooves. The axiopulpal line angle is beveled to prevent fracture in this region.

The cavity should be wider, and possibly deeper, at the junction of the proximal with the occlusal portion, in order to give the amalgam greater bulk for strength. The lesser crushing strength of amalgam requires that its buccal and lingual occlusal outline be prepared, as indicated in Figure 1, to avoid an acute angle at this point, as nearly as possible. All procedures influencing outline form as it relates to the area of liability to caries should be carried out in each class of cavity just as in any other permanent restoration.

Resistance and retention must necessarily be greater for amalgam than for either gold foil or inlay restorations. The pulpal floor, as a rule, can be wider than the occlusal marginal outline, if care is exercised regarding unsupported enamel rods. The proximal occlusal preparation requires that sufficient depth be provided for adequate bulk in the axio-pulpal region. Beveling or rounding of the axio-pulpal line angle eliminates the possibility of fracture at this point and provides additional bulk.

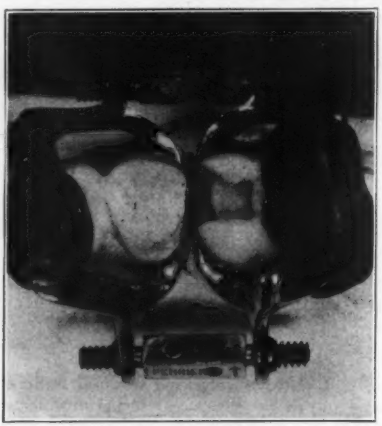

Fig. 3.—Separator and matrix suggested by Black.

The proximal portion of the cavity calls for maximum resistance and retention form to prevent, as nearly as possible, resistance to the flow of amalgam. Retention grooves are therefore indicated and should be placed at the expense of the buccal and lingual axial walls. (Fig. 2.) Protection of the pulp, particularly in younger persons, should

be considered; hence, the grooves should be cut at greater expense to the buccal and lingual walls, with the reverse gingival margin trimmers as angle formers. In utilizing natural undercuts for the purpose of retention, care should be exercised to protect frail, unsupported enamel walls against fracture under masticatory stress.

Removal of the carious dentin is of major importance. Neglect in this important matter is chiefly responsible for the criticism of amalgam restorations. The usual complaint, that carious material is found under amalgam, should not be directed at the material, but rather at those dentists who abuse amalgam through every step, from cavity preparation to the completion of the restoration. In spite of this abuse, the material should be given the further credit of saving these teeth longer than if another material had been employed. Satisfactory evidence has yet to be given to justify leaving carious dentin in the cavity, even when treated with silver nitrate or any other medicament.

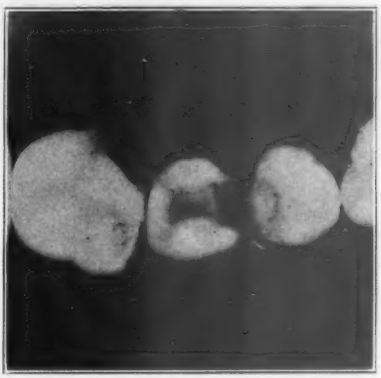

Fig. 4.—Hollenback matrix, using stainless steel 0.002 inch thick, ligated or wedged, and reinforced with low-fusing modeling compound, preventing it from yielding during heavy condensing forces. A smooth adequate contact is assured since the matrix material is very thin and highly polished.

The enamel walls should rest on sound dentin. First, in finishing the enamel margin, the operator must consider the direction of the enamel rods and must be certain that no rods are left unsupported. Secondly, the amalgam filling and the enamel margin should form right angles as nearly as the direction of the enamel rods will permit, to provide ample marginal bulk for the restoration. The gingival margin may be beveled, since there is relatively little stress upon it, and since this insures protection against unsupported rods at this point.

The finer details and toilet of the cavity should always, where possible, be completed within a dry field. The rubber dam is indispensable in operative procedures, and it is of particular importance during an amalgam restoration. After the placing of the rubber dam, the toilet of the cavity should be accomplished by freshening the walls by means of instrumentation, in order to remove all deposits and moisture. In deep-seated cavities, many prefer to sterilize the dentinal surface with ammoniacal silver nitrate, phenol or one of several other agents. However, if the pulp is closely approached, a cement base should be placed to protect it against thermal

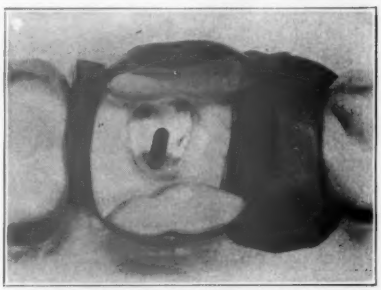

Fig. 5.—Root post cemented in position to provide additional retention. Gutta-percha is packed into the space to prevent movement during condensation. Copper bands are not recommended for matrices, except where contact has been lost through extraction and where restoration of cusps is necessary.

changes. Since amalgam has a lower degree of thermal conductivity than gold, a thinner cement liner should be employed, to meet the requirement of bulk. Hollenback[2] recommends that cement be mixed to a thick creamy consistency and that the mixture be completed with alloy filings. This provides a cement that will not crack or fracture when cut. In all cavities not requiring cement-base cavity liners, it is recommended that a copal varnish be used as a dentinal tubuli seal to prevent thermal conduction. After its application, the margins should be planed.

Fig. 6.—Calibrated mortar and pestle designed to register pounds pressure used in trituration. The pressure may be regulated and trituration timed in accordance with the manufacturer's direction.

As a final word on the importance of the rubber dam, the rule may be generally laid down that the dam should be in position during the entire packing operation and until the amalgam has become stiff enough to preclude the entrance of moisture into its mass or between the cavity walls and the filling material. Further, it should be borne in mind that the presence of saliva interferes with the adaptation of the material to the cavity walls, even though the walls are dry. Any residue of saliva allowed to remain on cavity walls should be eliminated before the filling is placed, to avoid a leaky margin. The presence of saliva also interferes with the cohesion of the mass, reduces crushing strength, causing brittleness (Taylor),[3] and causes corrosion of the amalgam.

MATRICES

All complex cavities require a well-adjusted matrix. In fact, it is common knowledge that many unsatisfactory restorations may be directly attributable to failure to use a suitable matrix. A matrix should (1) be easily contoured and should supply the equivalent of the lost wall; (2) allow for heavy packing pressure without any movement during adaptation and condensation of the amalgam; (3) prevent an excess of amalgam from being packed beyond the gingival margin; (4) permit removal without disturbing the marginal ridge or proximal contour, and (5) allow for restoration of the desired contact point.

Fig. 7.—Mechanical amalgamator in which cylinder of steel is placed in metal capsule and trituration accomplished by eccentric motion. The timer is set in accordance with the manufacturer's direction, providing an accurate means of preparing amalgam.

G. V. Black's technic is recognized as being sound in every detail, although it necessarily takes time. (Fig. 3.) It consists in the scribing of a rigid steel matrix, which is ligated firmly, the ligature encircling the tooth several times. Mechanical separation allows for the thickness of the matrix and for the adjustment of neighboring contacts. After the occlusal surface has been contoured, the separator is removed and the matrix straightened out. The separator is replaced, engaging the tooth structure with the matrix between the jaws of the separator, after which the matrix is easily removed, and the proximal surface contoured while the separator is in position.

Another type of matrix, recommended by Hollenback,[4] and given strong endorsement, consists of thin highly polished stainless steel 0.002 inch in thickness, securely reinforced by low-fusing modeling compound (tracing stick). (Fig. 4.) The embrasures and contact point are accurately formed by warming a beaver-tail burnisher and holding it on the cavity side of the matrix, the compound thereby being warmed sufficiently to allow shaping of the matrix. This provides a wall which will be absolutely tight and rigid during heavy packing. The mesiodistal contour and adequate contact are provided through the modulus of elasticity of the compound during the heavy packing, which causes sufficient separation to compensate readily for the thickness of the matrix material. The matrix is easily removed in a buccal to lingual direction, or vice versa, care being taken not to draw it occlusally. This method provides an excellent matrix of a practical nature and one that meets all the requirements.

It is occasionally necessary to use a seamless copper band as a matrix. Its use is indicated in the case of badly broken down teeth, particularly in treated molars where restoration of the cusps is necessary (Fig. 5) and where loss of contacts through extraction makes it impossible to ligate a matrix securely. The material is too thick unless the teeth have been slowly separated. Other difficulties may arise in its removal. Further, it is thought by some that copper and amalgam enter into a chemical reaction, producing unfavorable dimensional changes of the resulting amalgam restorations.

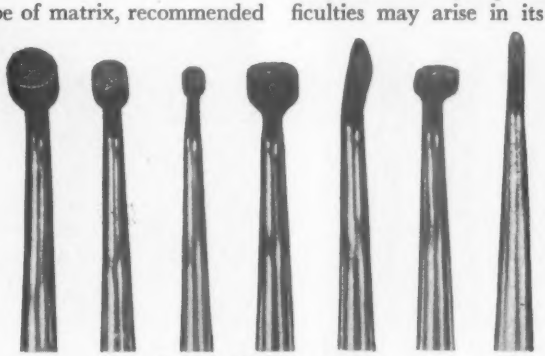

Fig. 8.—Black's condensers.

The Ivory matrix and holder are perhaps most widely used throughout the dental profession. The matrix is inadequate if it is merely tightened by the adjustable screw. During packing, an excess of amalgam is always forced beyond the gingival margin unless a gingival wedge is used. Moreover, it is suggested that the buccal and lingual embrasures be reinforced with low-fusing modeling compound, and that matrices be of 0.002 inch stainless steel, cut at

an arc so that the circle they form will be smaller at the gingival portion, allowing for proper flare of the contact point.

There are many other devices which are helpful in connection with the application of matrices. No effort should be spared to secure the best results with the least discomfort to the patient.

PREPARATION OF AMALGAM

The selection of the alloy is largely a personal matter. Any alloy which meets the American Dental Association's specification No. 1 can be considered satisfactory. In any event, the directions of the manufacturer should be carefully followed, since various amalgam alloys differ to a certain degree in particle size, composition and other characteristics.

Fig. 9.—Part of set of smooth faced condensers designed by R. K. Brown. The triangular condenser is valuable in condensation of acute angles in matrixed cavities.

For this reason, no standardized proportion of alloy and mercury, nor technic of mixing, can possibly suffice for the large number of accepted alloys, if we expect to obtain the best amalgam that each alloy is able to produce.

It is a well-known fact that manipulation is extremely important as regards dimensional change and other properties. In trituration, insufficient mixing increases expansion. Conversely, overtrituration may produce contraction. Other factors of importance in this connection are the size of the mix, alloy-mercury ratio, pestle pressure and type of mortar and pestle used. In using the hand-operated mortar and pestle, it is difficult to gage the pestle pressure. A pressure-regulated mortar and pestle will eliminate this variable, while standardization may be furthered by timing and counting the number of revolutions of the pestle. One of at least two instruments of this type available commercially is illustrated in Figure 6.

Recently, a successful mechanical amalgamator has appeared on the market. (Fig. 7.) If the manufacturer indicates the correct alloy-mercury ratio and trituration time, the dentist may expect a uniform as well as a properly triturated amalgam.

No mercury should be expressed during the mulling process. Expressing mercury at this stage will cause the amalgam to set partially, before condensation is completed. Furthermore, the addition of mercury to partially set amalgam reduces crushing strength, makes impossible uniformity of structure and causes unfavorable volume changes in the restoration.

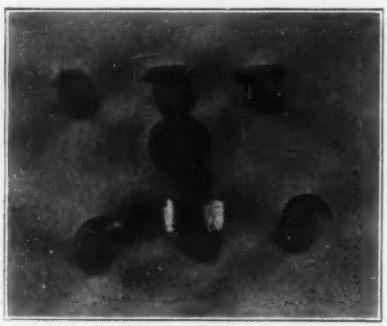

Fig. 10.—Special set of amalgam condensers designed by J. T. Sweeney for use in Hollenback pneumatic gold foil mallet or in hand manipulation. The particular shapes facilitate condensation into various parts of the cavity.

CONDENSATION AND ADAPTATION

The size and shape of condensers are important. In general, Black's condensers (Fig. 8) serve the purpose. However, many cavities present acute angles in the

dentin as well as in the marginal area, and mercury cannot be properly expressed if the condensers do not fit each angle. The special condensers shown in Figure 10 are designed for either manual or mechanical condensation, and are shaped to fit into the angles and curves of a cavity. The advantage in the ledge near the face of the instrument is the fact that it assists in removing mercury as condensation progresses.

One should first restore the proximal portion of the prepared cavity, starting with a small quantity of amalgam, using a large condenser to grasp the amalgam and, with all the power of the hand and with a vibrating motion, condensing this first quantity into the gingival part of the cavity. This tends to settle the amalgam into the angles, and brings the mercury to the surface, when it is expelled from the cavity. Adaptation and condensation should continue "on the same principle as the stepping of the instrument in packing gold to secure perfect adaptation to walls and margins; that is, the stepping should be from the mass of the filling already condensed towards the walls, finishing at the walls and wedging the last between the walls and the portion already packed." (Black.[5])

Condensation should be thorough and the amalgam should be adapted and so compressed as to remove the greatest amount of mercury with the least disturbance to the portion previously condensed. Each succeeding piece should be less plastic in order to absorb the free mercury which remains on the surface previously condensed. Black's technic of condensation is shown in Figures 11 to 14.

After the margins have been covered and the cavity has been overfilled, the

Fig. 11.—Restoration of proximal portion, removing mercury as it comes to surface, stepping instrument on same principle as for gold foil.

Fig. 12.—Proximal portion restored and built into occlusal step, with constantly decreasing plasticity of each piece of amalgam placed. Large condensers are used for compressing the mass as a whole and smaller ones for condensation into angles.

excess amalgam should be immediately carved away, no time being allowed for the mercury to diffuse into the portion of the amalgam which is to remain as the filling. The importance of this one step deserves considerable emphasis, for on it, many times, depends the success or failure of the restoration. The outer surface, if it contains more mercury, does not set to the same degree as the

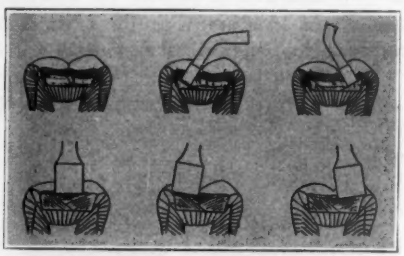

Fig. 13.—Steps in condensation of occlusal surface. (Black's Operative Dentistry.) Dry amalgam is condensed in a vibrating motion into the V-shaped groove, absorbing excess mercury from the underlying portions.

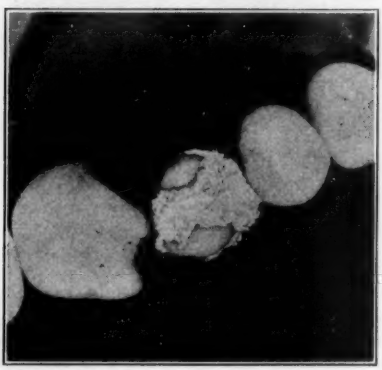

Fig. 14.—Cavity margins overfilled and allowed to set undisturbed. If the mercury has been properly eliminated, setting will be rapid and contouring may be begun soon after condensation is completed.

remaining underlying portion, weaker occlusal margins and lowered resistance to attrition resulting; and its polish will not be retained for so long a period. The cavity margins should again be covered and allowed to set undisturbed for two minutes or more.

CONDENSATION BY MECHANICAL MEANS

An interesting development in the manipulation of amalgam has been offered by James T. Sweeney.[6] Condensation is accomplished by malleting amalgam, from which all the free mercury has been removed, by special condensers (Fig. 10) in the Hollenback pneumatic gold foil condenser. Preliminary investigations are favorable since laboratory

Fig. 15.—Spoon excavators used to trim amalgam exactly flush to enamel margin and to accentuate grooves. Chisels are used, carving from the enamel to the amalgam. Amalgam must not be burnished, but should be contoured completely during its initial set. (Black's Operative Dentistry.)

Fig. 16.—Finished restoration. The grooves are not overaccentuated and the margins are carved flush to the cavity outline. All amalgam fillings should be polished.

tests indicate a decrease in flow of 50 per cent and an increase in tensile strength of 44 per cent, while expansion remains normal. Verification of these tests is also made by E. W. Skinner in this report. Clinical evidence recorded by Sweeney further substantiates these findings.

In following this method of manipulation, one finds that it resembles in prin-

ciple gold foil condensation. Each piece of amalgam is devoid of almost all free mercury and can be condensed thoroughly into all angles and portions of the cavity. This work warrants further investigation and appears as a definite contribution to the improvement of amalgam fillings. While further perfections are being offered and scientific data accumulated in the mechanical packing technics, the profession will do well to follow the principles of condensation as outlined by Black. His technic has been employed by thousands of dentists for many years and, where carefully followed, it has given splendid results.

CONTOUR AND FINISHING

The contouring of amalgam is a matter too often hurriedly disposed of. Amalgam should not be burnished during its initial set because an excess of mercury is thus carried toward the margins, weakness resulting where the greatest strength is desired. Spoon excavators and the discoid instrument may first be used for the bulk of trimming on the occlusal surface. One of these instruments should be carried lengthwise of each margin with a portion of its edge resting on the surface of the enamel. In this way, every particle of excess is removed without the danger of removing too much of the material and thus exposing a portion of the enamel which forms the enamel wall. (Fig. 15.) Emphasis is placed upon the importance of carving the amalgam exactly flush with the cavity outline. Particular care should be given to amalgam, since overlapping of margins produces the equivalent of a long bevel and, because of weak edge-strength, break down under the stress of mastication. A strong marginal ridge is recommended, but deep sulci leading to it are definitely contraindicated. Previous to the removal of the matrix, the occlusal embrasure can be easily contoured with margin trimmers of the proper angle.

Gingival excess is in amalgam restorations a rather common observation. Certainly, this is not due to the flow of the amalgam, and I am inclined to agree with Blackwell[7] that it is due to the use of improper matrices and failure to remove all excess amalgam either during the initial set or in the finishing and polishing.

Polishing may be accomplished by the use of smooth cuttlefish disks on the accessible margins, followed by flour pumice applied with a bristle brush or soft rubber cup. Care should be taken to avoid frictional heat during polishing, since this brings mercury to the surface and results in early discoloration. Finally, prepared chalk, or one of the several commercial preparations, may be applied with a brush or rubber cup in a dry field, to give the final restoration a mirror-like polish. (Fig. 16.)

As much pride should be taken in carving and polishing amalgam as in finishing a gold restoration, if it is to be a restoration of truly permanent character. This final step deserves much care and should be performed as conscientiously as any preceding part of the technic. Nothing less than this will do justice to the material, the operator or the patient.

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311 East Chicago Avenue.

FACIAL MASKS: A NEW TECHNIC USING A NEWLY DEVISED MATRIX FOR THE IMPRESSION

By JOHN L. KAUFMAN,* D.D.S., New York, N. Y.

AS the matter of taking facial impressions has been thoroughly covered in the literature, I shall not at the present time consider the details of taking the impression, except so far as it is related to the use of a tubular matrix which I have designed for the purpose of supporting the material.

Records of three dimensions are of unquestionable value in various operations about the teeth and mouth, particularly in orthodontics. The older men in orthodontia, such as Case, V. H. Jackson and others of their generation, indefatigably made a great many casts of the faces of their patients, although the only impression material at their disposal was plaster of Paris. In recent years, the development of compositions with agar as a base has given us a material which is much cleaner and easier to handle and is not disagreeable to the patient. However, it was found necessary to devise a means of overcoming a lack of body of the material when set.

I have devised a simple means of supporting the material in the process of taking the impression of the face and making the cast so that the resulting cast shall not undergo distortion, a condition due to the nature of the colloid and the weight of the casting material, especially if it is plaster.

To begin with, I use an agar compound for the negative impression. After applying to the face sufficient material to cover it and one-quarter to one-half inch in thickness, leaving the nostrils open for free breathing, I place the matrix with rubber tubing attached (Fig. 1), which has been previously adapted to the general contours of the features, continuing to add the material rapidly until the matrix is covered. The water is then turned on and allowed to run a short time, when the material is thoroughly chilled and ready to be removed. The matrix acts in two ways: mechanically, to give rigidity; thermally, to hasten the setting.

CONSTRUCTION OF THE MATRIX

One-eighth inch diameter brass tubing is employed in construction of the matrix, which is usually sold in 12 to 14 foot lengths, one length being sufficient for a single matrix. The material is first annealed by being passed over a gas flame until it becomes cherry red, then being allowed to air cool. An old plaster mask is helpful in bending the tubing. All bends should be as obtuse as possible to avoid constricting the lumen.

The matrix is shaped by carrying the tubing from the left side under the chin, and adapting it along the body of the mandible, carrying it upward and backward to contact the extreme end of the right ear; continuing thence upward and forward high along the forehead, across the median line of the face, downward and backward over the left ear, thence downward and forward below the body

Table clinic presented at a meeting of the New York Society of Orthodontists, March 14, 1939.

*Chief, Orthodontia Clinic, New York Post Graduate Medical School and Hospital.

of the mandible and along the chin. The wire tubing is then carried around the face in the same direction, clockwise, each coil being kept about 1 or 1¼ inches away from the preceding one, until four or five coils are formed (Fig. 2.) From this point, the tubing is carried obliquely downward and toward the median line below the chin, continuing upward and slightly backward over the right cheek in a rather wide sweep halfway between the median line and the extreme posterior end of the right ear. Then a rather sharp bend (care must be observed not to constrict the tubing), almost a right angle, is made (Fig. 2), the tubing being carried horizontally along the forehead parallel to the other coils to the median line. Now (Fig. 2) another right angle bend is made, and the material is carried down over the profile, contoured over the nose and lips generally, and finally bent under the chin, to meet the beginning of the tubing and again horizontally to extend the end of the tubing at the left under the chin.

Fig. 1.—Adapting matrix with rubber tubing attached after face is covered with initial layer of material.

Fig. 2.—Forming matrix over old plaster mask. Holes were drilled through plaster for passing the ligature wires to the down tubing during construction of the matrix.

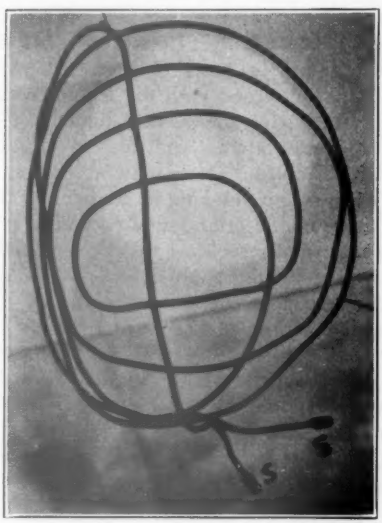

Fig. 3.—Finished matrix. S, spuds for attachment of rubber tubing.

In order to facilitate the attachment of the rubber tubing, spuds, about three-eighths inches in length, cut from brass tubing one-quarter inch outside and one-eighth inch inside diameter, are slipped

over the ends of the matrix and soldered. (Fig. 3 S.)

To facilitate the making of the matrix, holes are drilled in convenient spots (Fig. 2) on an old plaster mask, and the coils of tubing tied down here and there with ligature wire passed through the plaster, as the tubing is being adapted.

Wherever the tubing crosses or touches, it is tied up with brass ligature wire rather firmly, after which the ligatures holding the matrix to the plaster cast are cut and the matrix is removed from the plaster mask for soldering. Either silver or soft solder may be used, and every point where tubing contacts tubing should be firmly soldered in the open flame or with a blowpipe.

The resulting matrix is sufficiently rigid for the purpose designed, yet it is readily adaptable to variations in anatomic formation of the face.

39 West Seventy-Fourth Street.

ORTHODONTIC CONSIDERATION OF CASES TO OBTAIN NORMAL VERTICAL DIMENSIONS

By FRED E. HABERLE,* D.D.S., M.S.D., Chicago, Ill.

ORTHODONTIC treatment of the various types of malocclusion is concerned with the length, width and height or the vertical dimension of the dental arches and their associated soft structures. There may be some confusion in our thinking in considering the nature of the orthodontic problem. It is a matter of remolding and reshaping the bone about the teeth rather than of the movement of the teeth themselves. By gentle continuous pressure from orthodontic appliances upon the teeth, the bone about the teeth is stimulated to develop. Bone, being a plastic material rather than hard and rigid, is capable of changes in accordance with the stresses placed upon it. Kronfeld states:

> If a tooth is elongated by an orthodontic force, that is, if it is moved in an occlusal direction, the distribution of the bone changes are . . . new formations of bone along the alveolar crest and the fundus of the alveolus. If a tooth is depressed or shortened by orthodontic force, bone resorption will not be found uniformly around all the root, but particularly in the upper third toward the alveolar border. The alveolar crest which would be too high for its new, lower position is removed by resorption of bone at the alveolar border. Bone is resorbed wherever there is pressure and new bone deposited wherever there is a stretching force acting upon the bone surface.

Form and function go hand in hand where bone is concerned. The normal stress upon bone comes from masticating function, and its form and amount are dependent on the stress placed upon it.

This paper is concerned principally with the orthodontic treatment of abnormality in the vertical dimensions of the dental arches.

We are familiar with the condition which is called excessive overbite of the anterior teeth. (Fig. 1.) These teeth are

*Associate Professor of Orthodontia, Northwestern University Dental School.

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out of incisal contact; and, because of this abnormality, the supporting osseous structures are considerably altered. When the teeth are in centric occlusion, in severe cases, the upper incisors may entirely obscure the lower and may be biting into the soft tissues labially from the latter. The lower incisors may be biting into the soft tissues lingual to the upper incisors. In such conditions, the gums are red, painful and swollen, and

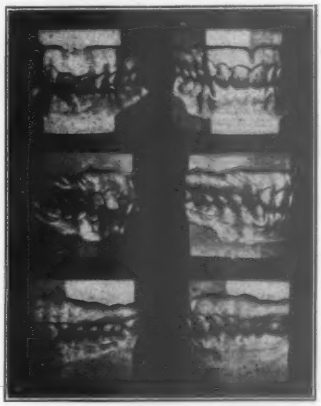

Fig. 1.—Excessive overbite of the upper anterior teeth. (McCoy.)

there is no avoidance of them each time the patient masticates or places his teeth in occlusion.

Attempts have been made to determine whether the vertical dimension is increased in the anterior region or decreased in the posterior in excessive overbite. It seems probable that both of these conditions are, to a degree, present.

This alteration in normal occlusion may be due to (1) labioversion of the upper anterior teeth (Fig. 2); (2) underdevelopment or collapse of the lower arch (Fig. 3), and (3) a distal relationship of the lower arch to the upper arch or a mesial relationship of the upper to the lower (Fig. 4).

In any of these conditions, with the lack of incisal contact, there is nothing to prevent elongation of the anterior teeth and perhaps depression of the posterior teeth, because of abnormal function and form.

As is true in the treatment of other types of malocclusion, the age of the patient and the period over which the irregularity has existed are factors. In the early years, bringing the incisors into proper incisal contact often causes sufficient bone change to effect their depression and establish a correct vertical dimension. Later, this may not suffice.

Various plans have been offered for the treatment of this condition. The direct application of force upon the teeth by means of arch wires (Fig. 5) or the use of a vulcanite appliance known as the bite-plate (Fig. 6) to bring about depression or elongation through bone

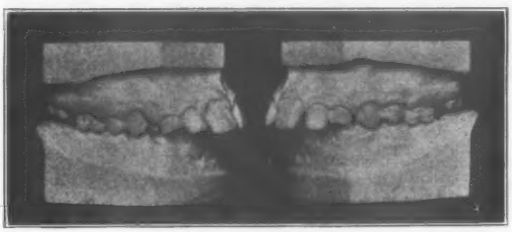

Fig. 2.—Labioversion of the upper anterior teeth. (McCoy.)

modification is suggested. McCoy's plan is stated as follows:

A consistent effort should be made to establish a correct occlusal plane by the elongation of the molars and the depression of the incisors, the latter movement being possible only to a slight degree. The upper arch wire is given a slight bend just in front of the buccal tubings so that when passive in

the mouth it stands above the gingival margin in the incisal region. It is then sprung down and ligated to the incisors or attached to them by means of open tubings, hooks, or brackets. The lower arch is treated in a similar manner.

In this way, a depressing force is used to modify and reduce the excessive amount of vertical bone.

Strang says:

The only way the author knows to successfully elevate molars and premolars, when they are in infraclusion is by means of using a vulcanite bite plate. . . . The depression of incisors is a tooth movement that can only be accomplished by the use of two mechanisms, the ribbon arch and the edgewise appliance.

In the Dewey-Anderson text, we read:

Simple widening of the arches will not change satisfactorily the relations of the teeth in an excessively deep bite. Therefore, a bite plate, whether it be removable or fixed removable is used. Other means of depressing incisor teeth and lengthening the posterior teeth are at our disposal. It is possible to band the teeth to be depressed or lengthened with an appliance, such as the ribbon arch, edgewise arch, pin and tube, or high labial arch, to exercise a satisfactory influence on these teeth.

In presenting some treated cases involving excessive overbite, the general plan will be to follow the case in accordance with the causative factor involved as mentioned earlier in this paper. The cases have been treated with the idea that the teeth, when so placed that it is possible for them to function normally, will themselves be adjusted to normal relationships. Of this idea, Strang says:

An approximation of the correct amount of overbite as a result of treatment will permit the natural forces of the denture, if they in turn have been restored to normality, to bring this detail of occlusion into harmony with the functional demands of that particular denture.

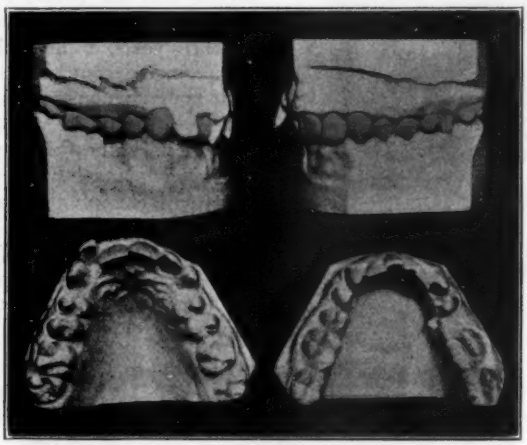

Fig. 3.—Collapse of lower arch. (McCoy.)

The first case to be presented is that of a Class I Angle type involving a labioversion of the upper anterior teeth in a child 12 years old. (Fig. 7A.) The upper arch is too long and too narrow and the upper incisors are displaced labially to such an extent that spaces exist between them. The lower arch form is reasonably good. The incisor teeth, owing to the fact that they are not in incisal contact, are elongated in both arches. Treatment, which consisted

in the widening and shortening of the upper arch and a slight increase in width in the lower, resulted in placing the incisors in normal incisal contact. Owing to this fact, the incisors were able to function normally, the bone about them was reduced in its vertical dimension and the excessive overbite was reduced. Figure 7B is an anterior view of the completed case. Figure 7C shows the difference in the amount of overbite as registered on the lower models before and after treatment.

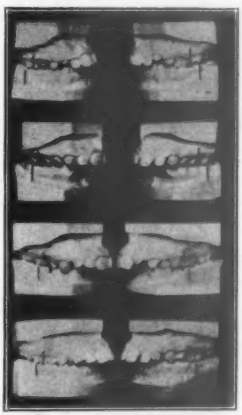

Fig. 4.—Lower arch in distal relationship to upper arch. (McCoy.)

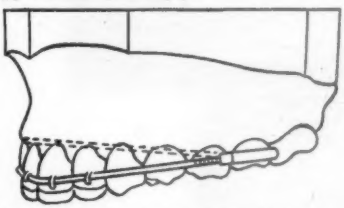

Fig. 5.—Upper labial arch with gingival force on upper incisors. (McCoy.)

Figure 8A shows a Class I Angle type malocclusion in a child 13 years old, involving underdevelopment of the lower arch, which is too narrow and much too short. Because the lower arch is too short, the upper arch is also, as the upper incisor teeth have followed the lower in an attempt to occlude with them. The upper arch is of reasonable width. The excessive overbite is due to lack of incisal contact and function. The first step in treatment consisted in lengthening the upper arch and thus providing clearance for developing the length of the lower arch after normal width had first been obtained. We then had normal width and length in both arches and the incisors were in incisal contact, a reduction in vertical dimension resulting from the restoration of function. Figure 8B is an anterior view showing the result of treatment. Figure 8C shows the difference in the amount of overbite as registered on the lower models.

Fig. 6.—Bite-plate. (McCoy.)

Figure 9A shows the models of a Class I Angle type in an adult aged 33 caused by a collapse of the lower arch that was due to the extraction, in earlier years, of the lower right first bicuspid to make room for the lower right permanent cuspid. With too little tooth material in the lower arch, collapse occurred, and the upper anterior teeth, in an attempt to occlude with the lower anterior, had retruded and rotated. With the lack of incisal contact and function, the bone about the incisor teeth became altered vertically. In treatment, the upper arch

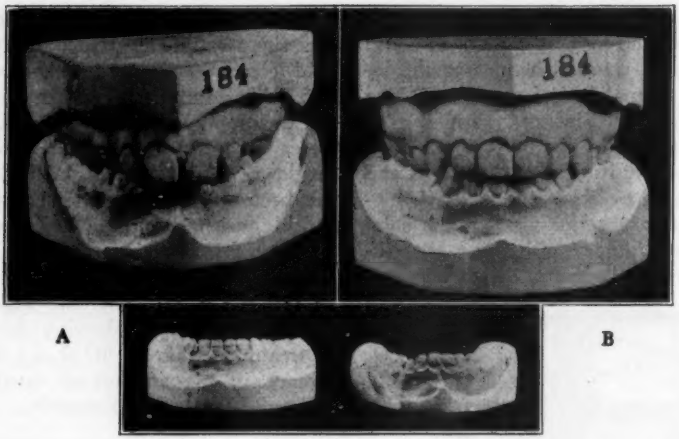

Fig. 7.—A, labioversion and excessive overbite of upper anterior teeth. B, anterior view showing correction of condition shown in A. C, right, condition before correction; left, change in amount of overbite as a result of treatment of condition shown in A.

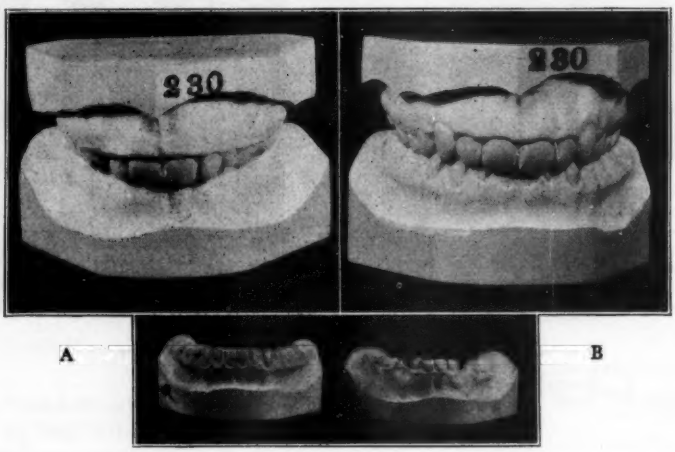

Fig. 8.—A, underdevelopment of lower arch and excessive overbite of upper anterior teeth. B, anterior view of correction shown in A. C, right, condition before correction; left, change in amount of overbite as a result of treatment of condition shown in A.

was first developed as to length to allow clearance for the lower arch development. The latter phase was accomplished by space being developed for an artificial substitute for the lost lower first bicuspid tooth. Thus, the upper and lower incisor teeth were restored to contact, and when these teeth were placed in function, the amount of vertical bone about them was reduced and the overbite corrected. Figure 9B is an anterior view of the completed case. Figure 9C shows the correction in overbite as registered on the lower models.

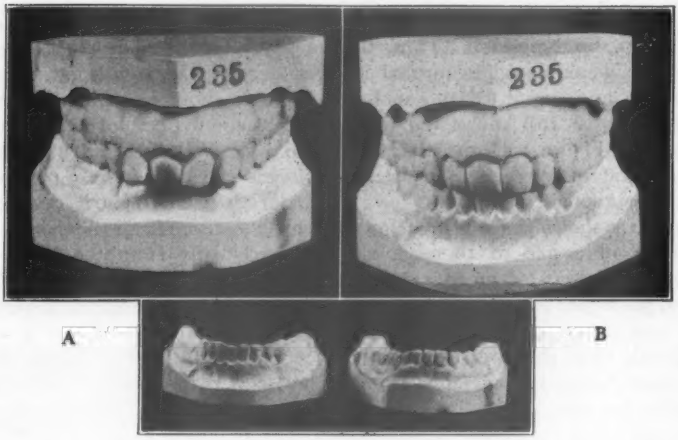

Fig. 9.—A, collapsed lower arch and excessive overbite of upper anterior teeth. B, anterior view of condition shown in A. C, right, condition before correction; left, change in amount of overbite as a result of treatment of condition shown in A.

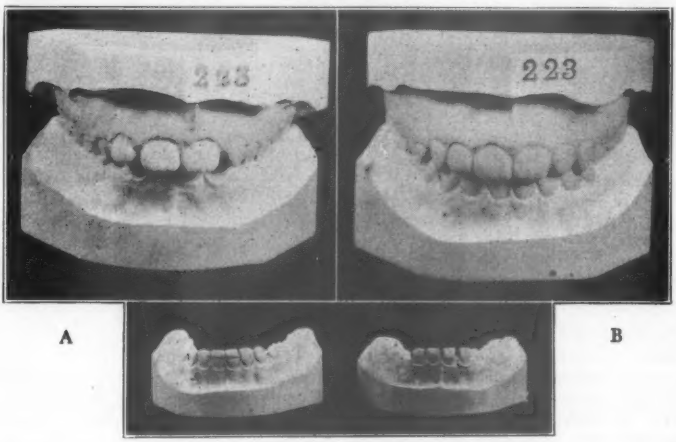

Fig. 10.—A, distoclusion, or Class II (Angle) type malocclusion, with excessive overbite of upper anterior teeth. B, anterior view of correction of condition shown in A. C, right, condition before correction; left, change in amount of overbite as a result of treatment of condition shown in A.

Figure 10A shows a Class II or distoclusion Angle type malocclusion in a child 10 years old. The upper arch is too long and too narrow, with spaces between the upper incisor teeth. The lower arch form is reasonably satisfactory, being slightly too long, but is in a distal relationship to the upper arch. Because of this fact, the incisor teeth lacked incisal contact, with the resultant alteration in the overbite. Treatment consisted in widening and shortening the upper arch. The spaces between the upper incisor teeth were thus closed. The lower arch

was shortened slightly and moved mesially from its distal position. Thus, the incisor teeth were placed in normal incisal contact and permitted to function normally. Figure 10B shows the result of treatment; Figure 10C, the alteration in the amount of overbite as registered on the lower models.

Figure 11A shows the case, a Class I Angle type, of a patient 19 years old. The upper arch was too narrow and too short and the upper left permanent lateral incisor was congenitally missing. The teeth distally from the upper left central incisor tooth had drifted mesially, closing the space for the lateral incisor. Because the occlusion was satisfactory, the space for the missing lateral incisor was left closed. Both arches were badly underdeveloped as to both width and length. Through development, the upper and lower incisor teeth were placed in incisal contact and normal function and the excessive overbite was corrected. Figure 11B shows the completed result; Figure 11C, the change in amount of overbite as registered on the lower models.

The next group of cases, which are of a severe type, will, I believe, be of greatest interest because they most closely resemble those in which full-mouth reconstruction is employed. In these cases, the overbite is so excessive that the lower incisor teeth are entirely obscured when the teeth are in centric occlusion. The upper incisor teeth bite into the soft tissue labially from the lower and the lower incisors bite into the soft tissue lingually from the upper, a very painful condition resulting. There is no incisal contact between the incisor teeth, the posterior teeth carrying the entire brunt of occlusion. The lingual surfaces of the upper incisor teeth are in immediate contact with the labial surfaces of the lower incisors. Frequently, the incisal edges of the lower incisor teeth are abraded, and these teeth are often loose because of trauma.

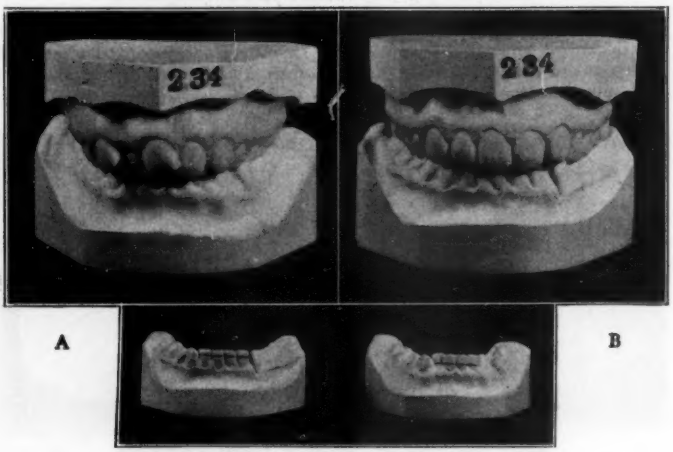

Fig. 11.—A, underdevelopment of both dental arches complicated by a congenitally missing upper left permanent lateral incisor. No incisal contact and excessive overbite of upper anterior teeth. B, anterior view of correction of condition shown in A. C, right, condition before correction; left, change in amount of overbite as a result of treatment of condition shown in A.

Figure 12 shows a case of this description, a Class I Angle type in a patient 15 years old. The upper arch is of fair width, but is too short, with retrusion of the upper incisor teeth. The

lower arch is somewhat narrow and much too short. The first step in treatment is to correct the retrusion of the upper incisor teeth, thus obtaining normal arch form in the upper arch. This is done by using a labial arch wire. (Fig. 13.) Bands are placed on the upper incisors and the teeth are moved labially. The bands are then used with spurs to retain this result and the appliance is removed. While this is being accomplished, a lower, lingual appliance has been used

Fig. 12.—Excessive overbite due to underdevelopment of lower arch.

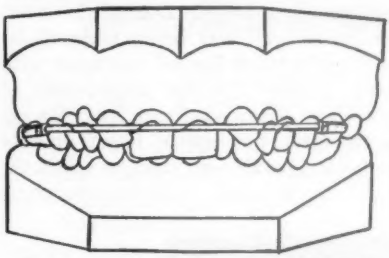

Fig. 13.—Labial arch wire. (McCoy.)

to secure greater width in the lower arch. (Fig. 14.)

The choice of appliance in the lower arch is limited to one of the lingual variety as the closed bite will not permit placement of a labial appliance, owing to interference from the upper incisors. Increase in width being accomplished, an increase in length is the next necessity. With the excessive overbite, after a small increase in length has been accomplished, the lower incisors are locked as far as any further movement is concerned, owing to their occlusion with the upper incisors. To obtain clearance for further labial movement of the lower incisors, it is necessary to open the bite.

A removable device called a bite-plate is frequently used for this purpose. It opens the bite and depresses the lower incisor teeth. It is placed on the palate with a ledge of vulcanite lingually from the upper incisor teeth and engaging the incisal surfaces of the lower incisors. When placed in position, the lower incisors are the only teeth in occlusion, and they are depressed and the posterior teeth elongated. The use of the bite-plate in the treatment of the cases being described is not considered desirable as

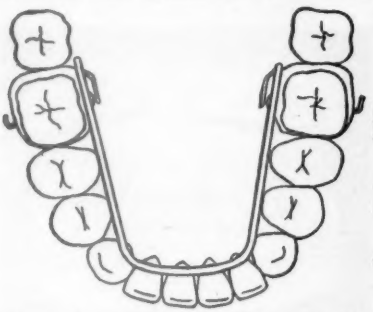

Fig. 14.—Lower, lingual appliance. (McCoy.)

it appears that the free labial movement of the lower incisor teeth would be hindered through their occlusion with the vulcanite of the bite-plate. A removable device for opening the bite with no interference with the free movement of the lower incisors has been devised.

Figure 15 shows the device, which may be of vulcanite or may be cast and is similar to the splints used in full-mouth reconstruction cases. It is placed on the palate and covers the occlusal surfaces of the upper posterior teeth. This is possible because, at this time, the upper appliance has been removed. The bite is thus opened and the free labial movement of the lower incisors

is made possible. When the labial movement of the lower incisor teeth has been obtained and the normal length of the lower arch thereby established, the lower, lingual appliance is remade. It is fitted well up on the lower incisors to provide support for these teeth. Through wearing the posterior bite opener, the posterior teeth have been somewhat further depressed. The patient is instructed to remove the bite opener, only for a part of the time at first, so that the incisors will not be too excessively traumatized. Then all the occlusal stress is on the anterior teeth and they are depressed while the posterior teeth are elongated. The lower lingual appliance is then worn as a retainer. Figure 16 shows the result of such treatment; Figure 17, the alteration in the amount of overbite as registered on the lower models.

Figure 18A shows the models of a similar case in an adult aged 38 now under treatment, a Class I Angle type malocclusion. The upper arch is somewhat narrow and too short. The lower arch has collapsed owing to the fact that the lower left first bicuspid tooth is completely lingual from its upper antagonists. The upper arch was first widened slightly and then lengthened. During this time, the lower arch was being widened by means of a lower lingual appliance with finger springs for the application of force. The upper appliance has been removed and the upper lateral incisor teeth have bands with spurs to retain the length of the arch. A bite opener is in position. The lower arch development has been continued as to width and length. Space has been provided for the lower left first bicuspid tooth and it is in proper position. Treatment has been carried on since the middle of last April.

Fig. 15.—Bite opening devices to be placed on posterior teeth.

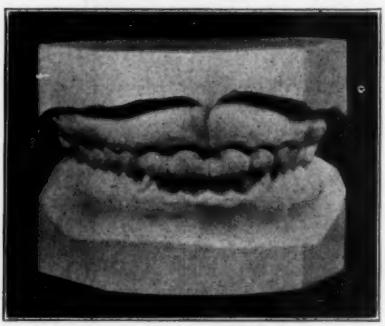

Fig. 16.—Change in overbite as a result of treatment of condition shown in Figure 12.

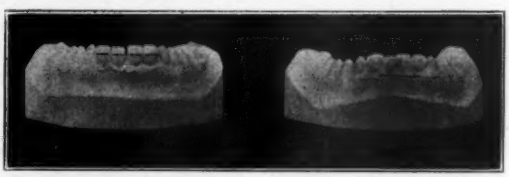

Fig. 17.—Change in overbite as registered on lower incisors of case shown in Figure 12; right, before, and left, after, correction.

Figure 18B shows models of the case made the middle of January, after being under treatment a period of nine months. Figure 18C shows the difference in the amount of overbite as registered on the lower models.

A recapitulation of the steps in treatment is as follows:

1. Development of the upper arch by means of a labial appliance.
2. Increase in width of the lower arch by means of a lingual appliance.
3. The placement of a posterior bite opener following establishment of the desired length in the upper arch.
4. Further development of the lower arch as to width and length by means of a lingual appliance.
5. Remaking of the lower lingual appliance to serve as a retainer.
6. Removal of the posterior bite opener.

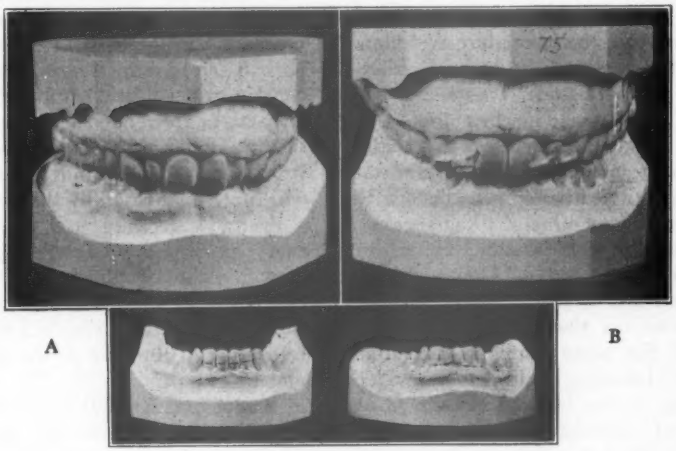

Fig. 18.—A, excessive overbite due to collapse of lower arch. B, change in overbite condition shown in A. C, left, registration of change in overbite on lower incisors; right, original condition.

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55 East Washington Street.

VITAMIN C DEFICIENCY, A CAUSE OF PERIODONTAL DISEASE

By Leslie J. Fitzsimmons, D.D.S., East Orange, N. J.

IT has long been the general rule among those treating periodontal disease to study the weekly food intake of the patient. Miller[1] and Merritt[2] recommend that this procedure be followed when treatment of the case is initiated; listing the work under the general heading of etiology. The fact that a diet which is predominately on the acid-ash side has been coupled with certain stages of gingivitis leads many to believe that the consequent mineral disbalance is an important etiologic factor. Herein may be found recorded data gathered from fifty patients whose average diets were well over on the acid side. All were treated for some form of periodontal disease. Likewise, there is more evidence pointing to the lack of vitamin C as a cause of periodontal involvement than to the acid ash-alkaline ash disbalance as the scource of the trouble. A suggestion for further reference to a bibliographic list will be found running through this article, with the thought that the reader will likewise come to the conclusion that much of the allegedly vitamin C-rich foods may be lacking in the element entirely, and that all diets seeking to increase the intake of ascorbic acid should be supplemented with a synthetic vitamin product of known strength.

ALKALINE OR ACID EFFECT OF FOODS

A diet definitely on the acid side of the balance is evidenced in unhealthy and undertoned gingival tissue; a tissue which is prone to bleed easily and which is slow in responding to local treatment. The patient presenting this symptom will be found living on a diet rich in protein foods; e.g., meats, fish and eggs, plus a generous quantity of cereals, coffee and tea. These foods tend to exert an acid effect in the body. When they are burned (oxidized) in the body, a number of the normal end-products are acidic; i.e., contain uric, sulfuric or phosphoric acid. Such acids are rendered innocuous when they are balanced with alkaline material from the body, forming neutral salts, which are eliminated by the kidneys.

Fruits, vegetables and milk usually exert an alkaline effect, because they contain salts of alkaline metals; e.g., calcium, magnesium, sodium and potassium, which are available for the neutralization of the acid products from the metabolism of proteins. The acid salts of fruits and vegetables and the free acids, e.g. citric (lemons), malic (apples), tartaric (grapes) and lactic (sauerkraut), are oxidized in the body to carbonic acid, which is readily eliminated in the breath. The bicarbonates, phosphates and proteins, which are always present in the blood, serve as buffers and balancing agents and protect the tissues and blood against sudden changes in their normal faintly alkaline reaction. These alkaline reserves may become depleted by a diet containing great quantities of acid-ash foods, but the body never becomes actually acid in reaction. If that came to pass, for even a brief period, death would occur.

We might add here that certain organic acids (benzoic, quinin) that are present in such foods as cranberries, plums and prunes are not oxidized in the usual manner. The net effect may be acidic, even though neutral salts are

ACID-BASE BALANCE IN RELATION TO SYSTEMIC AND LOCAL CONDITIONS

	CASE NUMBER	PATIENT'S AGE	SEX		ACID %	ALK %	DIET BALANCE ACIDULATE REACTION	EVIDENCE OF SYSTEMIC CAUSE		EVIDENCE OF LOCAL CAUSE	
								YES	NO	YES	NO
	1	34	M		61.9	38.2	X			X	
	2	36		F	45.0	55.0	X			X	
	3	24		F	55.2	44.8			X	X	
	4	35		F	58.9	41.1			X	X	
	5	29		F	46.4	53.6			X	X	
	6	28		F	57.4	42.6			X	X	
	7	34		F	49.6	50.4			X	X	
	8	42		F	54.2	45.8			X	X	
	9	40		F	32.4	67.6			X	X	
	10	38		F	52.0	48.0			X	X	
	11	26		F	65.5	34.5			X	X	
	12	36	M		51.0	49.0			X	X	
	13	27		F	46.4	53.6	X			X	
	14	37		F	76.1	23.9	X			X	
	15	49		F	49.1	50.9			X	X	
	16	35	M		53.6	46.4	X			X	
	17	34		F	55.0	45.0			X	X	
	18	50		F	63.6	36.4			X	X	
	19	30		F	49.1	50.9			X	X	
	20	31		F	54.0	46.0			X	X	
	21	36		F	59.6	41.4			X	X	
	22	40	M		75.0	25.0	X			X	
	23	40		F	65.5	34.5	X			X	
	24	34		F	60.8	39.2			X	X	
	25	55	M		54.6	45.4	X			X	
	26	51		F	40.0	60.0			X		X
	27	55		F	47.0	53.0			X	X	
	28	28		F	36.8	63.2			X	X	
	29	28	M		51.8	48.2			X	X	
	30	38	M		29.6	60.4			X	X	
	31	39		F	41.8	58.2			X	X	
	32	39		F	43.4	56.6			X	X	
	33	43	M		43.5	56.5			X	X	
	34	34		F	72.8	27.2			X	X	
	35	33		F	59.6	40.4			X	X	
	36	39		F	43.0	57.0			X	X	
	37	40	M		58.3	41.7			X	X	
	38	42	M		56.9	43.1			X	X	
	39	41		F	48.4	51.6	X			X	
	40	38	M		62.7	37.3			X	X	
	41	50		F	60.5	39.5	X			X	
	42	34		F	41.0	59.0			X	X	
	43	47		F	48.2	51.8	X				X
	44	42	M		48.0	52.0			X	X	
	45	37		F	68.7	31.3	X			X	
	46	53		F	53.0	47.0			X	X	
	47	27		F	45.1	54.9			X		X
	48	40	M		49.0	51.0			X	X	
	49	35	M		67.1	22.9			X	X	
	50	34		F	45.1	54.6	X			X	
TOTAL	50	1887	14	36			13	37		47	3
AVERAGE		37+	MALE / FEMALE		53.268	47.732	26%	74%		94%	6%

present. Then, too, oxalic acid is poorly oxidized and its presence in foods, such as rhubarb, chard, spinach, beet leaves, cocoa and tea, prevents utilization of an equivalent amount of calcium. When such foods are eaten, a liberal supply of calcium from other sources should be provided.

It has been upon this theory that the oral indications of poor mineral balance of the weekly diet are accepted by those treating periodontal diseases. The reader is advised to further investigate the work of Winchell[3] and Moore[4] for a better understanding of mineral metabolism and acid-base diets.

ACID-ASH DIETS AND LACK OF VITAMIN C

It is significant that the grand average of the fifty patients' diets shown in the accompanying table was on the acid side of the balance, and that all the patients were treated for some form of periodontal involvement. This would seem to bear out the work of Miller and Merritt. However, the most important suggestion is that a diet which is heavy on the acid side of the balance is bound to be free of vitamin C.

We have but to suggest the addition of vitamin C-containing foods to a diet and we immediately picture the promise of a swing from acid-ash predominance to one of alkaline-ash.

IMPORTANCE OF VITAMIN C

In the minutely detailed work of Hojer,[5] and that of Wolbach and Howe,[6] strong evidence is presented as to why a diet definitely acid-ash and consequently vitamin C-free results in many of the periodontal involvements which are correctly termed subscorbutic conditions. This group of investigators produced definite evidence as to why bleeding in the mesenchymal tissues is a prelude to bleeding gums. This weakness in the intercellular substance of the walls of the capillaries offers a basis for the early stages of inflammation, which later on is interpreted by the dentist as a gingivitis. A gingivitis starting under these conditions, be it ever so slight at the start, will eventually end in serious periodontal disease.

With this most positive evidence before us, we now seek to fortify our patients suffering from periodontal disease with a diet that will produce a condition in which not only alkaline food predominates, but likewise sufficient vitamin C is present.

VITAMIN-C REQUIREMENTS OF THE BODY

As a gage for the amount of vitamin C required by the body, let us refer to Smith[7] for an excellent suggestion:

> Whatever may be the uncertainty about the upper limits of requirement there seems no doubt that the 30 mg. as stated by the Technical Commission on Nutrition of the Health Organization of the League of Nations "to be a curative dose for adults suffering from scurvy," should be considered only as a minimum for protection against scurvy and not as the optimum for satisfactory nutrition. For even this, the frequently recommended allowance of 50 mg. should probably be considered as the barely adequate, rather than the optimal requirement, with considerably larger quantities desirable when economically possible.

UNCERTAINTY OF VITAMIN C SUFFICIENCY FROM NATURAL SOURCES

We seek the optimum of the bodily requirement of vitamin C and quite naturally our thoughts turn to foods which are said to be rich in the needed substance. If, however, we are to accept the findings of Bessey,[8] the recommendation of foods reported to be rich in vitamin C amounts to a gross presumption. This writer proves that vitamin C-containing foods are affected by certain conditions, which cause the loss of the precious substance. Heat (moist and dry), contact with oxygen, drying of food, processing for preservation, contact with metals (especially copper) and wilting tend to destroy the very unstable

vitamin in its natural source. Then too, lack of maturity or freshness, and long storage or poor preservation or improper methods of cooking fruit or vegetables may result in its loss.

Therefore, the use of natural sources of ascorbic acid, in the type of therapy that we have in mind, is not dependable.

The case is cited of a physician doing ear, nose and throat work who sought to improve the inner ear tissues of a patient suffering from a chronic condition. The patient, otherwise normal and very cooperative, accepted the suggestion to increase the vitamin C in the diet by natural methods. He promptly added to his diet 3 quarts of citrus fruit juice daily. The physician felt quite sure the overabundance of fruit juice would show its effect in the tissue, but, to satisfy his curiosity, he first submitted the patient to the ordinary urine test for vitamin C. To his great surprise, there was no evidence of vitamin C in the urine; neither was there any change in the tissue upon subsequent examination of the involved area.

Laboratory research and clinical observation lead one to believe that much of the highly rated vitamin C-containing foods may lack the vitamin, and regardless of the high alkaline-ash content of a diet, actual hypovitaminosis (C) may be present, and will continue if too much dependence is placed on the natural source of supply.

RATIONAL ACID-ALKALINE ASH FOOD AND VITAMIN C THERAPY

A rational procedure during the preoperative stage of treatment of periodontal disease is one in which a complete picture is obtained of the patient's weekly food intake.

The various foods in the diet are listed according to acid-alkaline ash value. Tables from which this information can be obtained are found in many textbooks on nutrition or in pamphlets issued by the many better known and reliable food canners. (Heinz.[9])

The food items are divided into the total acid-ash foods and multiplied by 100 and two decimal points marked off. This gives a fairly accurate percentage of the acid-ash foods. The same procedure is followed to obtain the alkaline-ash percentage.

The patient being treated for some form of periodontal disease may be reluctant to try, or may find it difficult, to adjust the diet to contain sufficient vitamin C or to establish the ideal balance of 60 per cent alkaline food to 40 per cent acid food. The great value coming from such a rearrangement should be explained, along with the possibility of a more nearly complete and rapid change in the condition involving the periodontium. The invaluable aid of the physician practicing internal medicine, with his tests of the urine and blood, invariably will clinch the argument in your favor and overcome a stubborn attitude.

Granted that in time the patient will adjust his diet and by so doing obtain a small amount of vitamin C, supplementary vitamin feeding should be started by prescribing an accepted synthetic cevitamic acid tablet. A convenient form is the 25 mg. tablet, which contains 500 international units of C. The necessary vitamin-C intake for an adult is 1,000 to 1,500 units daily. There is little danger of overdosing in this type of therapeutics, as has been explained by Smith, quoted earlier in this article.

The food list presented by the patient may bring to light the fact that soft non-detergent foods, as they are called by Miller,[10] are making up a great part of the diet. This fault of the menu can be brought to the attention of the patient and suggestions made for its correction. A diet of soft foods not only offers little exercise for the teeth and gums, but also is generally on the acid-ash side, and likewise lacks vitamin C.

As was said before, this procedure is a rational one and also falls within the bounds of propriety. It avoids all semblance of "food faddism" and will aid materially in subsequent operative work.

Wolbach and Howe[8] have explained that healing of wounds progresses normally only when an adequate vitamin C intake is maintained. If, then, previous to actual operation on the pyorrhea pocket, the vitamin C intake is brought up to normal, the possibility of arresting the slow breakdown of the gingival tissue, so common in all forms of periodontal disease, will be enhanced.

SUMMARY

A diet decidedly on the acid-ash side contains little vitamin C. This disbalance has been found in a great percentage of cases of periodontal disease.

A simple mathematical calculation of the acid-alkaline ash percentage is advisable at the beginning of treatment of periodontal disease. It may bring to light very dangerous overuse of soft "non-detergent" foods.

Research has proved that many foods supposedly containing vitamin C are subject to conditions that easily lower the content of ascorbic acid or completely destroy the acid.

Complete dependence on natural source is inadvisable. As laboratory workers have shown that the healing of wounds progresses more rapidly when vitamin C nutrition is at its height, it is expedient, for a more satisfactory result, that the vitamin-C intake be increased.

CONCLUSIONS

From the data presented in the accompanying table, we may conclude that the typical patient requiring periodontal treatment is a woman 37 years of age, with a food balance well on the acid side of the scale, with no evidence of a systemic condition, but much evidence of a local condition.

The thirteen cases that gave evidence of a systemic condition were diagnosed only after great care had been exercised in making out the case history, and through invaluable aid given by the internist.

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144 South Harrison Street.

HEREDITARY INFLUENCE MANIFESTED BY THE ABSENCE OF LATERAL INCISORS

By J. Reese Beyrent, D.D.S., Steelton, Pa.

A STUDY of hereditary influence is here presented in a record of a family certain members of which had no permanent lateral incisors, or only one. There was an excellent opportunity for study because of the size of the family, which consisted of the mother, twelve children and five grandchildren, and the willingness of the mother to cooperate in the study.

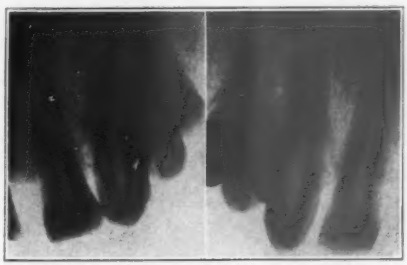

Fig. 1.—Absence of both upper lateral incisors in Joseph, second child, aged 35.

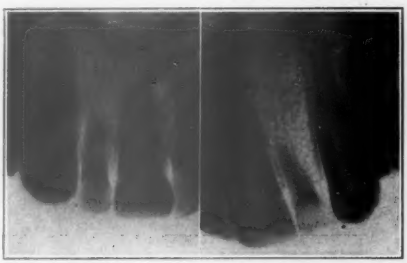

Fig. 2.—Both upper lateral incisors missing, deciduous incisors in place, in Catherine, fourth child, aged 30.

Fig. 3.—Right upper lateral incisor missing, left in place, in Annabelle, fifth child, aged 27.

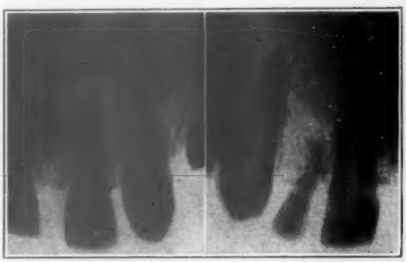

Fig. 4.—Both upper lateral incisors missing, left deciduous incisor in place, in Barbara, sixth child, aged 25.

The father (deceased) had had the normal number of incisors. In the mother, the upper permanent lateral incisors were missing, the condition being noted at the time all the teeth were extracted in preparation for full dentures. During the course of her dental work, the mother had occasion to bring two of the children to the office with her. When it was noted that one of the children had a lateral incisor missing, a roentgenographic examination of the whole family was suggested.

The children ranged in age from 9 to 40 years; the grandchildren, from 6 to 12. Examination revealed that three of

the children had both upper lateral incisors missing and three had one missing. The record for the entire family was as follows:

Mother, aged 60, both lateral incisors missing.

Mary, aged 40, both lateral incisors in place.

Joseph, aged 35, both lateral incisors missing.

Lawrence, aged 33, both lateral incisors in place.

Catherine, aged 30, both lateral incisors missing; deciduous incisors in place.

Fig. 5.—Right upper lateral incisor missing in Frances, eighth child, aged 18.

Annabelle, aged 27, right lateral incisor missing.

Barbara, aged 25, both lateral incisors missing; left deciduous incisor in place.

Helen, aged 20, both lateral incisors in place.

Frances, aged 18, right lateral incisor missing.

Josephine, aged 16, left lateral incisor missing.

Margaret, aged 14, both lateral incisors in place.

William, aged 12, both lateral incisors in place.

Jean, aged 9, both lateral incisors in place.

Robert, Richard and Betty, children of Mary, both upper permanent lateral incisors present or in process of eruption.

John and Mary, aged 6 and 10, children of Catherine, both lateral incisors formed.

It is hoped that additional information

Fig. 6.—Left upper lateral incisor missing in Josephine, ninth child, aged 16.

can be obtained on the hereditary influence evident in this family, since the mother has three sisters living in this community, two of them the mothers of large families.

Figures 1 to 6 show roentgenograms of the abnormal cases.

15 North Front Street.

GENERAL FUNCTIONS OF AN ENDOWED DENTAL INFIRMARY FOR CHILDREN

By JOHN OPPIE MCCALL,* D.D.S., New York, N. Y.

THE Forsyth Dental Infirmary in Boston was the first large endowed institution established for the purpose of giving free dental care to children. Its founding came through the realization by the Forsyth brothers that children sometimes suffer the pangs of toothache and that this pain could be avoided if the child's teeth were properly cared for. It was soon followed by the Rochester Dental Dispensary, the gift of George Eastman, whose similar gifts to several European cities are well known. The Murry and Leonie Guggenheim Dental Clinic was founded ten years ago, service in the building it now occupies beginning in the Fall of 1931. All of these clinics, together with a number of others, which time will not permit me to enumerate, had as their avowed object the provision of dental care for children whose parents could not command service for them in the private dental office.

It has been virtually a quarter of a century since the founding of the Forsyth Infirmary, and it seems our obvious duty to survey the field of the endowed dental infirmary for children and to decide in the light of advancing knowledge during that period whether this type of institution should function simply as a service clinic or should add other functions in order to live up to its full possibilities for community ministration.

The founding of a dental clinic for poor children is more than the expression of a desire to stanch the tears of a child afflicted with dental disease. It is a tacit acknowledgment of an obligation of man to succor his brother in trouble. As such, it might well remain purely in the field of philanthropy or that public form of philanthropy known as welfare work; but the years that have passed since the Forsyth Infirmary was founded have seen the development of a knowledge of focal infection as a cause of disease and the discovery of vitamins as the well-springs of nutrition. These two forces, one essentially destructive, the other essentially constructive, have brought dental disease forcibly, although with somewhat reluctant acknowledgment, into the field of public health. The latter development, full import of which is not yet recognized, has resulted in some confusion. It is safe to say that, in the public interest and in the interest of economy as well, this confusion should be resolved.

The dental profession, groping its way toward truth, became convinced of and proclaimed the health value of a mouth free from abnormality and disease long before knowledge of the mechanism of focal infection was developed. The early efforts of the Rochester Dental Society and of dental groups in other cities to provide free dental services for children, antedating the founding of the endowed infirmaries, was an indication of this

Read before the Section on Children's Dentistry at the Seventy-Sixth Annual Midwinter Meeting of the Chicago Dental Society, February 13, 1940.

*Director, The Murry and Leonie Guggenheim Dental Clinic.

conviction, a conviction which was crystalized and dramatized by Ebersole of Cleveland and further developed by Fones and numerous others.

It is not intended that this shall be a historical paper, but it is necessary that the proper perspective be gained for consideration of the subject; and this requires that we call to mind the background against which we should view the present situation. Thus we see in the endowed dental clinic a consciousness on the part of the profession that unclean, diseased mouths are a health handicap, especially to the child; that dental disease is painful and disfiguring as well, and that the treatment of such disease is beyond the reach of the children of the poor. To these points should be added the further fact, brought out repeatedly in surveys made at intervals during the past forty years, that dental disease is widespread in the cities and even in the rural areas of this country.

Fig. 1.—Bite-wing roentgenograms of child of 5 years; showing extensive caries in all second deciduous molars, also distal cavities in lower first deciduous molars, and proximity of caries to pulps of involved teeth.

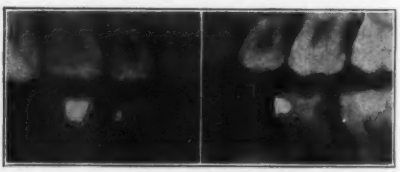

Fig. 2.—Bite-wing roentgenograms of child of 7 years; showing fillings and extensive caries in lower deciduous molars, and small distal cavity in upper right deciduous second molar. The proximity of the caries to the pulps is evident.

The initiative in the founding of a new public health service is usually taken by private enterprise, either through individual philanthropy or through an association of interested laymen. The movement for the prevention and treatment of tuberculosis is a typical example, resulting, as it did, in the founding of national and local tuberculosis associations. When the need and health value of such a service have been demonstrated, the work is taken up and usually expanded by governmental action. Thus, today, our city and state health departments, stimulated in large part by the so-called voluntary associations, are carrying on active campaigns to stamp out tuberculosis. In view of this commonly occurring sequence, the question is sometimes asked, "Should not the voluntary organization suspend its operations when the government agency enters the field, since public health activity is thus acknowledged to be an obligation of the government?" It is the answer to this question that we shall ponder here, with consideration for its dental implications.

The giving of health service whether in the field of tuberculosis or dental disease requires not merely provision of the service itself, but also a constant effort to improve that service as advancing knowledge makes this possible. This means repeated revaluation of diagnostic methods and of methods of prevention and treatment. There must also be an occasional study of the incidence of the given disease in the community as revealed by vital statistics, so that the need for the service may be judged, as also the effectiveness of the methods being used for its treatment. Costs must be kept down as far as is consistent with adequate service, and there must, therefore, be means for determining proper costs for a service. There should also be education of the public as to means of prevention, and approved methods of treatment, in the interests of lowering the morbidity rate and of economy. Our

question must be answered with these various considerations in mind.

Experimentation based on constructive imagining is the *sine qua non* of effective development of any of the items mentioned above; and it has come to be accepted that the organization supported by private contributions is the agency most aptly situated for such experimentation. In addition, it has also been found that the voluntary agency may perform an invaluable function by acting as a means for checking the effectiveness of operation of the governmental agency.

A few examples will serve to illustrate the application of the foregoing principles in the field of dentistry. In the matter of diagnosis of dental disease, the roentgen rays come readily to mind. In spite of all that has been said and written during the past twenty years as to the advantages of the roentgenogram in dental diagnosis, its use for children has been very limited. As far as I know, the Guggenheim Dental Clinic is the first dental infirmary for children to make the roentgenographic survey a routine part of the examination of each child admitted. May I explain the significance of this routine by stating that children are received at the clinic from schools and day nurseries nearby without previous dental examination and hence are not presumed to have dental disease when admitted.

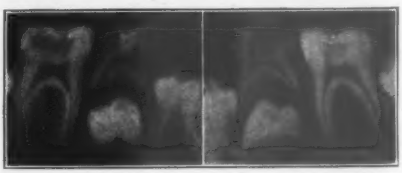

Fig. 3.—Periapical roentgenograms of child of 8 years. In first permanent molars, which showed pre-carious occlusal fissures, but no break in the occlusal enamel on mouth examination, deep occlusal caries is evident. The caries in the deciduous molars and the root resorption are to be noted.

As I have previously[1] pointed out the value of this procedure in routine examination, I need not recapitulate in detail. Let me mention one point especially: the varied usefulness of the bitewing roentgenogram in relation to proximal caries. In the first place, the bitewing film, if taken with the proper x-ray angulation, shows proximal caries at a stage when it cannot ordinarily be detected by the explorer. Early detection of proximal decay is always important, but especially so in the deciduous molars, in which the pulps are large and are quickly exposed by the penetration of undetected caries. (Figures 1 and 2.)

Fig. 4.—Cast showing Wesoke space maintainer extending from deciduous cuspid to deciduous second molar.

Another use for the bitewing film is to determine, in a carious tooth, the extent of caries, and especially its proximity to the pulp. By this means, the prognosis for the tooth can usually be determined without the expenditure of valuable operative time in excavating the cavity.

It is important to know, among other things, how frequently new bite-wing roentgenograms should be taken to be effective in the detection of proximal decay before it has penetrated to the

pulp. At the Guggenheim Dental Clinic, it has been the usual practice to repeat this examination at yearly intervals. In susceptible mouths, this has been found to be too long an interval. Pulp exposures are sometimes found in such cases, both in permanent and in deciduous teeth. Recommendation is therefore made that patients be recalled for examination, including bitewing films, at nine-month intervals, at least in northern cities where decay is most prevalent.[2]

Roentgenograms have no function in the discovery of early pit and fissure caries; but routine periodic bite-wing films will register this type of decay when the dentin is involved and, as in the case of proximal caries, will give warning of the approach of caries to the pulp, also usually indicating when pulp involvement has occurred. (Figure 3.)

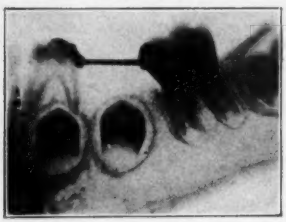

Fig. 5.—Roentgenogram showing Wesoke space maintainer in mouth of child of 6½ years.

Much has been said and written in late years about space maintainers. At the Guggenheim Clinic, it was decided at the outset that a period of observation should precede the adoption of a policy in this field. Mention has been made[3] of the lack of uniformity of results in the case of spaces resulting from premature extraction of deciduous molars. In a large number of cases, there is little or no loss of space. In many others, lost space is later regained.

However, in many cases, there is a permanent loss of space, and measures should be taken to prevent this shrinkage if a suitable means can be found. Numerous designs of space maintainers have been suggested and used. Most of these have an orthodontic or a similar band as the basis of the appliance. The orthodontic band has disadvantages, chief among which is the tendency for caries to occur at its gingival margin. This necessitates removal and recementing of the bands at regular intervals. If the connections are rigid, there is an anchorage of the banded teeth that may affect unfavorably the ultimate positioning of these teeth or their successors. Construction or placement of the bands involves a time expenditure that needs consideration in a free dental clinic or a government dental service.

Fig. 6.—Malocclusion of anterior teeth in boy of 8 years. Gingivitis and recession around the lower right permanent central incisor and, to a lesser extent around the left central incisor, are evident.

Quite as important as devising a suitable space maintainer is the determination as to the case in which it will be needed. Where teeth are present on each side of the space, measurement of the space can be made by a piece of wire and recorded. This will be compared with similar measurements made at intervals of three, four and eventually six months. A loss of space of 1 mm. is not important unless it takes place soon after the extraction, in which case there is a

presumption that further loss of space will soon occur.

Keep in mind that reference is here made to space created by loss of deciduous molars only. When permanent teeth are lost, movement of adjacent teeth, with loss of space, always takes place, although often rather slowly. Spaces so created should always be cared for as early as possible.

Two simple forms of space maintainers have been put in use at the Guggenheim clinic recently. The form which seems likely to have the greatest application, especially where it may have to remain for a number of years, was suggested, and first applied, nearly a year ago, by Philip Wesoke, of our staff. It consists of a bar of round stainless steel, 18 gage,

Fig. 7.—Corrected malocclusion of case shown in Figure 6, at age 11. The improved gingival condition around the lower incisors is to be noted.

whose ends are embedded in amalgam fillings placed in the proximal surfaces of each of the teeth adjoining the space. (Figures 4 and 5.) The other is of stainless steel ligature wire of moderately heavy gage, twisted around and connecting the teeth on each side of the space. The technic for the first form, which provides for slight independent movement of the abutment teeth, is as follows:

The cavities which are nearly always found on the proximal surfaces facing a tooth that has had to be extracted are prepared in the usual manner for Class II, with the gingival margin close to the gingiva. The usual cement lining is applied, and a piece of wooden toothpick, to serve as a measure of bar length, is then cut so it will drop into the cavities, sufficient clearance being provided so that about 1 mm. at each end will be engaged by the amalgam. At this point, note should be made as to whether there will be a sufficient bulk of amalgam occlusally to the bar to insure against future breakage. The ends of the bar are rounded over and each end is dipped several times in cavity lining or other varnish, each application being allowed to dry before the next coat is applied. After the bar has been in the mouth for a short time, this varnish will be dissolved, and a minute amount of play will be allowed for the bar.

The teeth are isolated with cotton rolls; the cavities and the bar are carefully dried, and a small amount of amalgam is placed on the gingival wall. This is burnished to a thin layer where the bar is to be placed, which should be about midway between the buccal and lingual surfaces of the teeth. The bar is then placed and the insertion of amalgam is continued, with tight packing around the bar. The fillings are completed in the usual way. The use of matrices, while desirable, has not been found necessary in the average case. Where they are used, notches will be cut so that the matrix will fit over the bar.

Where there is suitable occlusal height of the anchor teeth to permit sufficient bulk of amalgam, the Wesoke space maintainer is eminently satisfactory. Caries is no more apt to occur on the anchor teeth than would be the case if no bar were present, since the position of the bar near the gum minimizes food retention. When a deciduous tooth used for an anchor tooth must later be extracted, the bar can be slipped out of the filling in the remaining tooth and the

cavity thus created filled with a little fresh amalgam.

While on the subject of occlusion, it may be well to refer to another new procedure developed at the clinic in the past few years. With, as yet, no orthodontia department, attention has been directed toward ameliorating some of the simpler types of malocclusion that are of such common occurrence among children. It has been found that many cases of simple malposition of the anterior teeth can be corrected by the use of contractile ligatures either alone or in conjunction with certain exercises that can be performed by the child at home. This service has been largely developed by Max Kaminetsky, of our staff. Strange as it may seem, simple movements involving primarily only two or three anterior teeth seem to bring in their train beneficial developmental changes extending well beyond the area of actual treatment. This subject is presented here with technic and results approved by a number of orthodontists, whose scrutiny has been both careful and critical.

One of the typical and distressing types of malocclusion that can be corrected thus simply, and one that can cause much harm if not corrected, is lingual malposition of one or more upper incisors, the teeth involved biting lingually to the lower incisors. In those cases, there is a severe traumatic occlusion of the upper and lower teeth which are in malposition, with alveolar resorption, gingivitis and usually tooth mobility. There is also marked limitation of mandibular excursion and decrease of functional use of the jaws, with probably an unfavorable influence on jaw growth and development. Usually, this condition can be corrected by the child himself by pressure applied with an ordinary tongue depressor or similar flat narrow piece of wood. The blade is inserted in such a manner as to engage the lingual surfaces of the upper and the labial surfaces of the lower incisors. The child holds the blade and applies sufficient pressure to cause the blade to bend appreciably. This pressure is maintained steadily for from fifteen to twenty minutes. The exercise is repeated at least three times daily, preferably four. If there is sufficient room for the upper incisor to pass into its proper position between the adjoining upper teeth and the child is conscientious, the movement can be accomplished in from two to three weeks. (Figures 6 and 7.)

Open spaces can be closed by the use of orthodontic grass line ligatures. If it is desired to have movement of only one of the two teeth between which the space occurs, the ligature is placed on additional teeth at the anchor end of the space. It must be secured tightly, usually at the cervix, around each tooth that is ligated. In crossing the space, it is well to bridge it with several knots so that the last knot almost, but not quite, makes contact with the farther tooth. In that way, the ligature will hug the tooth tightly when tied; otherwise, it will tend to slip off. Teeth may be rotated by applying the ligature with a slip-noose and taking a turn with both strands around the tooth in the direction in which it should rotate. The ligature is carried to the next or a suitable nearby tooth, where it is secured.

A surprising number of combinations of the foregoing technics, tongue blade and ligature, can be developed to meet various situations within the range of the method.

Retention is, of course, needed for most of these cases. However, the tooth brought over from the lingual to the labial position is self-retentive. Incidentally, this procedure opens the bite slightly at the time the tooth is passing over the lower incisors, which seems to encourage development in the posterior segments, the ultimate result being altogether more satisfactory than would be expected from so simple a movement. With other tooth movements, the desired

retention is obtained by substituting stainless steel ligature wire for the grass line ligature. Whereas the grass line ligature becomes foul and must be changed at least every three days to avoid severe gingivitis, the stainless steel wire is tolerated remarkably well by the gingivae, seeming not to cause even mechanical irritation. It may be left on for three or four months if desired.

Turning now to the subject of statistics, I should like to point out a few of the facts brought out in our annual reports that have significance. It is important from both the dental and the public health viewpoint to collect figures showing actual susceptibility to dental caries. This is something that is not shown in the average report of dental conditions among school children. These reports dwell on the mouths that need attention and on accomplishment of the dental health program in terms of the number of children whose mouths have been put in order. Such figures are of value, but tend to be misleading as indicating how widespread dental disease is in the child population. The figures at the clinic are tabulated to show not merely how many children need dental attention, but also those who, either at the time of examination or in the past, have had dental decay; in other words, total susceptibility to caries.

For example, we find that the percentage of new patients with caries had been around 98 for the first six years of operation. In the past two years, a greater proportion of preschool children have been admitted, and as children free from caries are found chiefly in this group, the percentage of new patients with caries in the past two years has dropped to 96. So much for the incidence of caries in children previously untreated. For recalled patients, the percentage of those who have developed cavities or who have fillings previously placed (previous caries) mounts to over 99.

The average number of cavities per child in the new patients ranges from nine to eleven over the eight years of operation. New cavities in recalled patients have been increasing year by year. This is due, in part at least, to the fact that an increasing number of the recalled children are in the 10 to 14 year group, with large numbers of recently erupted bicuspids and second permanent molars the occlusal fissures of which decay and must have protective fillings soon after they appear in the mouth. The figure now stands at approximately four new cavities per child in the recall group. However, about 4 per cent of the recalled patients who previously had caries had no new cavities.

Figures on caries are kept in greater detail for preschool children than for older children. Most of the preschool children come to the clinic from nearby day nurseries, where they are left by mothers who must go out to work. As no dental selection is made for clinic attendance, we get a good cross-section of the dental condition of preschool children in the low income group in New York. We not only keep the percentages with caries by age, but also the percentages with few and with many cavities.

In 1938, the percentage of preschool children with caries by ages was as follows: 2 years, 59 per cent; 3, 84; 4, 90, and 5, 96.

These figures vary only slightly from year to year. They indicate the great importance of bringing children under dental supervision and care at an early age, preferably 2 years. This is exemplified still further by the corresponding age increase in the number of cavities per child. In recent years, more than 30 per cent of the 2-year olds have had more than seven cavities; while more than 40 per cent of the 3-year olds, 50 per cent of the 4-year olds and 60 per cent of the 5-year olds have a similar incidence of caries. When I add that it is our experience that the child with seven or

more cavities in the deciduous teeth has to lose at least one tooth, the significance of these figures becomes apparent.

Consideration of the preschool child brings me to another topic that is both interesting and important from the standpoint of dental health. I have written before[2, 3] on a condition of the deciduous teeth that I have called hypoplastic enamel and that has been called hypocalcified enamel by Kronfeld.[4] It is a condition that evidently predisposes the tooth to caries of a very destructive type. Putting together the fact that much of the deciduous enamel, especially of the anterior teeth, is laid down before birth and information gained through considerable clinical observation, I have advanced the theory that this condition of the enamel, or the susceptibility to caries that goes with it, is due to faulty prenatal nutrition. This might be caused by a deficient or unbalanced diet or an illness that would affect metabolism during pregnancy.

My theory is not in accord with the ideas of Schour,[5] who points to the neonatal ring as indicating that the entire outer covering enamel of even the deciduous central incisors is of postnatal genesis. Proceeding from this theory, he claims that the decay which I have attributed to a prenatal fault really can be caused only by a postnatal deficiency.

I do not question Schour's histologic evidence and I congratulate him on his brilliant work on the neonatal ring. I nevertheless find it difficult to explain many conditions that I see in the clinic on the basis of his findings, unless we are to revise quite drastically other concepts that seem well established. For example, it is generally agreed that calcification of the first permanent molars begins a little before birth and that of the permanent central incisors begins at about birth. On this basis, hypoplasia of these teeth is commonly associated with postnatal disturbances, such as rickets, or with vitamin deficiency, in the first year or so of life.

If the foregoing facts regarding the permanent teeth are true, and if Schour's hypothesis is also true, we should expect both deciduous and permanent teeth to suffer from the same defects. But this is not true. I have been able to follow children who had the severe caries of the deciduous teeth that I have attributed to prenatal fault, and I have seen their permanent incisors and first molars erupt with perfectly formed enamel and with no especial susceptibility to caries. On the other hand, I have seen children with well-formed and resistant enamel on the deciduous incisors who had severe enamel hypoplasia of the permanent incisors and first molars.

Time will not permit the citation of further evidence on this point. I should point out, however, that there is also much to be said in regard to the possibility of controlling caries of the deciduous teeth by exceptional postnatal care. This would include fortification of the food ration with adequate intake of the various vitamins. For example, I recently saw twin girls, not identical, aged 6½ years, one of whom had suffered excessive caries of all deciduous teeth of the type that I have associated with enamel defect. The other had only a few small areas of decay and this inactive. The mother's dietary had been unbalanced during pregnancy, with adequate mineral intake, provided by milk, but inadequate vitamins. The girls were given cod-liver oil from birth, but the one who later had the severe decay refused orange juice. As she was quite spoiled, there is some question as to her even having taken sufficient cod-liver oil.

The fact that one twin did not have severe enamel defects with decay does not invalidate, in my estimation, the theory of the relation of defective deciduous enamel to prenatal nutritional faults. I believe, in other words, that we have very good reason to say that the preventive

dental program begins in the prenatal period, but I also believe that a superior nutritional program after birth can give a high degree of protection.

It will be seen from the foregoing discussion that one of the natural functions of the endowed children's dental clinic is the carrying on of studies which have as their object the discovery of means to prevent dental caries and other dental disease. There should also be some effort in the direction of health education, since only in this way can the knowledge gained through research be disseminated in the community and made effective in the prevention of dental disease. Publication of educational material is one effective device, and the clinic has made some effort in this direction.[2] We also use, to some extent, the method of individual interviews with mothers of children who suffer severely from dental caries.

The clinic should be so set up that conditions may be established not only to conduct appropriate studies in this field, but also to try out carefully and test the value of the methods evolved. This implies a certain limitation on admission so that there may be opportunity for careful observation and follow-up of those who are admitted. These conditions cannot be established in a dental program supported either wholly or in part by government funds.

It is generally accepted today that essential community health services must be dispensed to certain population groups by government health departments, and dental care is coming to be considered one of these essential health services. If this view is correct, it is not sound policy to attempt to set up endowed dental clinics of such size and scope as to relieve the local government entirely of its obligations in this respect. At the same time, carefully planned and strategically placed endowed dental clinics may serve a most useful end in arousing appreciation of the need and value of dental service in the community and assisting in the planning of the government program.

I have attempted to present a general view of what I conceive to be the proper functions of the endowed children's dental clinic. I must apologize for introducing into one short essay so many diverse topics, no one of which could be followed through completely in the time allotted. I did think it important, however, to present with reasonable illustration the numerous items that may be encompassed in a dental program made possible through private benefaction. I have also attempted to indicate that it is important that more institutions of this type be set up in various large population centers in order that a satisfactory check may be provided as to methods to be followed in giving dental care in government programs and developing statistics, research and health education.

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SURVEY OF DENTAL LABORATORY INDUSTRY IN CONNECTICUT

By JOSEPH MASSARO,* B.S., Ch.E., Hartford, Conn.

DURING the past quarter century, considerable effort has been expended and great progress has been made in the elimination and control of the silicosis hazard prevalent in a wide variety of industries in the United States. Another industry, dental plate manufacturing, previously unsuspected, recently made its initial appearance among the industries presenting a silicosis hazard when a fatal case[1] of silicotuberculosis developed in a 35-year-old worker, who had been engaged exclusively in the operation of plate polishing in a dental laboratory for nineteen years.

This operation, one of the many steps in the manufacture of dental plates, is conducted on a high-speed bristle-brush wheel, using wet pumice as the buffing agent. A finely ground pumice is mixed with water in a shallow pan situated beneath the revolving polishing wheel, and the resulting "pumice mud" is applied to the surface of the plate. The plate is then held against the fast revolving bristle brush, and this operation is continued, with repeated applications of "pumice mud," until the desired smooth finish of the denture is attained.

Pumice, a cellular glassy volcanic residue, is composed of a complex silicate of aluminum, sodium, potassium, calcium, magnesium and iron, with little free silica present. The world's chief supply of pumice is the Lipari Islands, in the Tyrrhenian Sea just off the north coast of Sicily and under Italian control. In the United States, there are commercial deposits in several of the central and western states.

Because of its low free-silica content, one would not expect pumice, in the concentrations to which dental laboratory workers are exposed, to be capable of producing silicosis. Investigation, however, disclosed that a material containing a high percentage of free silica was being substituted for the pumice abrasive. This practice originated during the World War, when great difficulties were encountered in obtaining a sufficient supply of the Italian pumice. The substitute material, marketed under the name of "pummy," cannot be distinguished from genuine pumice by its physical appearance. Equally satisfactory results are obtained with the use of either "pummy" or pumice. For economic reasons, "pummy" has displaced pumice to a large extent as the abrasive material used in the dental laboratories for plate polishing.

In view of the findings in the previously mentioned fatal case of silicotuberculosis, a conference was held with the Director of the Division of Mouth Hygiene, a list of laboratories was obtained and a complete survey of all commercial dental laboratories in Connecticut was conducted to determine the conditions under which the technicians were working.

The general operations in the manufacture of artificial dentures consist, first,

*Assistant industrial hygienist, Bureau of Occupational Diseases, Connecticut State Department of Health.

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of making a plaster model from the impression taken by the dentist, plaster of Paris or "artificial stone" being generally used for this purpose. From this, a base-plate is made and the teeth are set in it in wax. After the dentist has tested the teeth and the plate in the patient's mouth, the base-plate is invested in "artificial stone" in a plate flask, a positive and negative mold being made. The wax is then either melted or scraped out, the teeth remaining in the lower half of the flask and ready for packing. According to the type of denture desired, either

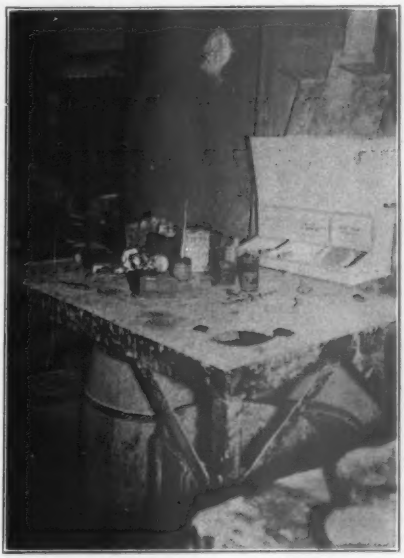

Fig. 1.—Plaster molding bench; showing poor housekeeping.

rubber or an acrylic resin is packed in around the teeth in the flask. Rubber was originally used for artificial denture work, but is fast being replaced by acrylic resins because of their esthetic value. After packing, the two halves of the flask are clamped tightly together. If made of rubber, the plate is vulcanized by placing the flask in a small vulcanizer for three hours at 320° F. If the plate is made of acrylic resin, the flask containing it is processed in either hot water or steam. After sufficient curing or vulcanizing, as the case may be, the "artificial stone" is broken from the plate. The plate is then trimmed on a small sandpaper wheel and polished on a high-

Fig. 2.—Non-ventilated plate polishing wheel.

Fig. 3.—Specially designed plate polishing exhaust unit, which is very effective.

speed bristle-brush wheel using wet pumice. Any adhering pumice is then washed off with hot water and the plate is given a high polish on a small cloth wheel, using tin oxide, rouge and tripoli.

A very neat denture, closely resembling the natural teeth and gums, is the final product.

The only significant health hazard in the operations conducted during the manufacture of dental plates is presented by the free silica dust produced during the plate-polishing operation. However, several other operations, presenting health hazards of less importance, merit consideration. The use of chloroform as a solvent for the removal of wax from the artificial stone investment should be carried out with caution because of its toxicity. Proper precautions should also be taken during the handling of the acrylic resins with the bare hands because of the action on the skin of the solvents used to keep the resin sufficiently plastic for packing. These solvents dissolve the protective oils of the hands and, if contact is not kept to a minimum, a dermatitis is quite likely to result. Several such skin conditions were observed among dental mechanics during this survey. The use of hand creams is recommended for protection against the onset of such skin conditions.

During the vulcanizing operation, the sulfur in the rubber is oxidized to sulfur dioxide, and this evolves to the general room atmosphere with the steam when the vulcanizer is released, unless other methods of disposal are employed. Several methods of removal of this irritating gas are resorted to: exhausting the gases to the outdoors through a copper or rubber tubing, absorbing the gases by bubbling through water and employing a fan for general ventilation of the workroom.

The use of boiling acids for the cleaning of gold and other metal bridgework should be conducted under an exhaust hood.

Little concern is given the plaster molding operation because of the relatively innocuous material being handled, but from conditions observed in many of

Fig. 4.—Manufactured plate polishing exhaust unit; showing poor maintenance.

Fig. 5.—Manufactured plate polishing exhaust double unit.

TABLE 1.—DISTRIBUTION OF WORKERS

Size of Laboratory According to Number of Workers	Number of Laboratories	Total Number of Workers	Percentage of Total Workers in Industry
1-2	32	47	25.5
3-4	17	57	31.0
5-10	8	44	23.9
11-20	1	11	6.0
Greater than 20	1	25	13.6
Total	59	184	

TABLE 2.—PETROGRAPHIC ANALYSES OF "PUMICE" SAMPLES

Free Silica Content					
Number of Samples Less Than 5%	Percentage of Total	Number of Samples 80-90%	Percentage of Total	Number of Samples Greater Than 90%	Percentage of Total
3	57.9	5	8.8	19	33.3

*Fifty-seven samples of "pumice"; no samples obtained from two laboratories.

TABLE 3.—MECHANICAL EXHAUST EQUIPMENT

Polishing Wheels					Air Exhaust			
Total Number	Ventilated		Non-Ventilated		Outdoor		Indoor	
	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
60*	45	75	15	25	16	35.6	29	64.4

*There were two plate polishing units in one laboratory.

TABLE 4.—DUST EXPOSURES IN PLATE-POLISHING OPERATIONS

Ventilated Units			Non-Ventilated Units		
Dust Concentration*	Number of Samples	Percentage of Total	Dust Concentration*	Number of Samples	Percentage of Total
Less than 2	37	74	Less than 10	24	50
2-10	13	26	Greater than 10	24	50
Total	50			48	

*Millions of particles per cubic foot.

the laboratories, such as that shown in Figure 1, housekeeping about this plaster molding bench can be considerably improved.

The dental laboratory industry in Connecticut includes fifty-nine laboratories, employing a total of 184 workers, 179 male and five female. Most of these

laboratories conduct their operations in a small room and employ only a small personnel, each operator performing any or all of the operations necessary in making artificial dentures. As seen in Table 1, thirty-two of the laboratories employ only one or two workers, or a total of forty-seven employes, or 25.5 per cent of all operators in the dental laboratory industry. In forty-nine of the laboratories having four or less operators, a total of 104 workers are employed, or 56.5 per cent of those in the state. The other ten laboratories, of five or more workers, employ eighty, or 43.5 per cent of the total in the industry. The average dental laboratory in Connecticut employs three operators.

In each of the laboratories surveyed, a sample of the "pumice" being used was obtained and petrographic analyses were made to determine the free-silica content. Of the fifty-seven samples collected, thirty-three, or 57.9 per cent, contained less than 5 per cent free silica, and may be said to be genuine pumice. Of the other twenty-four samples, nineteen were found to contain more than 90 per cent free silica, and five between 80 and 90 per cent. In 42.1 per cent of the laboratories, therefore, a substitute "pumice," in all probability ground quartz, was being used without the knowledge of the dental laboratory operators. The continued use of this substitute material without adequate exhaust equipment would, of course, be accountable for any cases of silicosis that might develop in this industry.

Of the sixty plate polishing units examined in the dental laboratory industry in Connecticut, forty-five, or 75 per cent, were provided with exhaust equipment, and fifteen, or 25 per cent, were without any means of ventilation, as is seen in Figure 2. Only sixteen, or 35.6 per cent of the forty-five ventilated units, were provided with an exhaust to the outdoors. The other twenty-nine, or 64.4 per cent, allow the filtered air to be recirculated to the room. It is recommended that, wherever possible, these units have an exhaust to the outdoors.

Several concerns manufacture exhaust units for dental plate polishing. These units handle between 165 and 300 cubic feet of air per minute. The most effective exhaust unit found in the dental laboratories is shown in Figure 3. Here, a fan of large capacity is used and 6-inch exhaust ducts permit the removal of a much larger volume of air than is possible with the manufactured units. As can be seen, housekeeping about this unit is excellent. In Figure 4 is shown an example of poor maintenance found on a number of occasions. Clogging of the throat of the exhaust duct with pumice mud definitely affects the efficiency of the exhaust unit. In Figure 5 is shown a large double unit, well-kept and functioning efficiently, preventing the dissemination of injurious dusts to the workers' atmosphere. Proper maintenance of the equipment shown in Figure 4 would result in as effective an exhaust as that shown in Figure 5.

During the course of the survey, ninety-eight grab samples were taken with the Kotzé konimeter to determine the dust concentrations to which the plate-polishing operators were exposed. Fifty of these samples were taken on ventilated units, while forty-eight were taken at polishing wheels with no provisions for the removal of the dust produced by their operation. As seen in Table 4, thirty-seven, or 75 per cent, of the samples taken on exhaust wheels, showed concentrations of less than 2,000,000 particles per cubic foot of air.

The remaining thirteen, or 26 per cent, were above 2,000,000, yet below 10,000,000 particles. The forty-eight samples taken where operators were exposed at non-ventilated polishing wheels showed twenty-four, or 50 per cent, to be less than 10,000,000 particles per cubic foot

and twenty-four to be greater than 10,000,000. Concentrations found during the operation of the non-ventilated units were found in excess of 51,000,000 particles per cubic foot of air. Ventilation of these wheels has been found effective in maintaining dust concentrations below 5,000,000 particles per cubic foot of air.

As a result of this survey, all plate polishing wheels in the dental laboratories of Connecticut must be furnished with mechanical exhaust. Ten of the fifteen laboratories conducting this operation without exhaust equipment at the time of the survey immediately installed mechanical exhaust units.

The technicians in the dental laboratory industry of Connecticut were very receptive toward our survey and also cooperative in following out the recommendations presented. It is believed that with recognition of the potentialities of the various materials being handled, and with the installation of mechanical exhaust for plate polishing units, the potential health hazards of the dental laboratory industry in Connecticut are being controlled.

BAKING PORCELAIN INLAYS DIRECTLY IN THE INVESTMENT WITHOUT THE USE OF A PLATINUM MATRIX

By DWIGHT T. BARCROFT, D.D.S., Chicago, Ill.

PORCELAIN inlays are not meant to be used in every type of cavity, nor is porcelain the ideal filling material. No one filling material is ideal for every condition, but often we become so enthusiastic about something that we apply it to every possible condition.

Most dentists prefer the gold foil filling, the gold inlay or the synthetic porcelain filling to a loose-fitting porcelain inlay. The porcelain inlay, when made with platinum foil and high-fusing porcelain, requires not only a more detailed technic, but also more expensive equipment, and results are less satisfactory.

These conditions have been largely overcome by the introduction of low-fusing porcelain having nearly all the good qualities of the high-fusing material, and the production of a porcelain investment whereby the platinum matrix is eliminated. The porcelain investment does not fuse or break down at a temperature under 2100° F., and it is easily and quickly brushed from the inlay, leaving an etched surface ideal for cementing.

This paper presents a simple method of making porcelain inlays in one's own laboratory. The method is no more difficult than making a gold inlay, but the steps must be followed carefully. The discussion will be confined to Class V, or gingival, cavities because the porcelain inlay is most commonly used in this class.

CAVITY PREPARATION

The cavity is prepared as for a gold inlay except that the cavosurface angle is not beveled. It is desirable to make the cavity a little deeper and more nearly circular if possible. The more nearly cir-

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cular the cavity, the more nearly uniform the shrinkage of the porcelain. The walls will be slightly divergent from the base of the cavity and will meet the base at a definite angle.

IMPRESSION OF THE CAVITY

Modeling compound is, I believe, the ideal impression material for this class of cavity whether we are making a gold inlay or a porcelain inlay. A piece one-quarter inch long is cut from a stick of compound, and a contra-angle bur heated and embedded in the surface of one end of the compound. This affords a handle with which to hold the material in taking the impression, and later the file can be run over the bur and the investment be vibrated onto the impression. The tip is softened and molded somewhat to the shape of the cavity by bringing it to a point or flattening it out. Now, the compound is chilled to hardness in cold water and dried.

It is important that the compound be hard after shaping, because it is necessary to force the tissue back to get a good impression of the gingival margin of the cavity. The hard compound behind the softened tip acts as a support to compress the compound in the cavity. The shaped and hardened material is now passed quickly through the flame so as to just soften the tip, and is forced to place in the cavity. Then, with the plugger end of the wax spatula, the compound is pressed against the tooth all around the cavity and chilled with cold water. One may use any familiar method for taking the impression, but this technic, once mastered, is quite simple and accurate. Two impressions of the cavity should always be taken.

INVESTING THE IMPRESSION

A small ring of wax or masking tape is made, a quarter inch high and large enough to receive the impression. The porcelain investment is mixed fairly thick and vibrated onto the pattern by running a file over the bur attached to the compound. The ring is filled with investment, the bur removed from the pattern and the impression placed in the ring. Two inlays should be made for each cavity, as this will, in many cases, save an appointment, and it requires little more time.

It is advisable to let the investment set for an hour or longer. It is then dipped in hot water and removed from the impression material. All excess investment is trimmed away around the model to allow free access to the cavity, and the margins are painted with methylene blue. This makes evident any excess porcelain on the margins.

APPLYING THE PORCELAIN

The model, treated with methylene blue, is put into a Wagner matrix holder, which facilitates vibrating the porcelain into the model. If any one step is more important than another, that step is condensation.

The model is first dipped in water and the excess water thrown off. The shade has been chosen at the time of taking the impression.

The porcelain is mixed thoroughly, with a bone or agate spatula, and the excess moisture removed. The porcelain is worked into the angles of the cavity with the porcelain spatula and vibrated by running the serrated portion across the Wagner matrix holder, gradually filling the cavity and vibrating, drawing the moisture through the investment by holding a piece of gauze under the model. The moisture is not drawn from the top. The porcelain is vibrated until most of the moisture is out of it, but just before all of the water is out, enough porcelain is added so that, when condensed to a point where no moisture appears on the surface, the porcelain will bulge slightly from the cavity. If this first application of porcelain is made properly, only two bakings will be necessary. Care must be exercised not to let the porcelain in the

cavity get out onto the margins. It is always well to run the porcelain instrument over the margins to remove any possible excess.

FIRST BAKING

Porcelain does not fuse at a given temperature. We say that porcelain fuses at 1875° F., but this is not true, because we do not take into consideration the time. Temperature plus time is the fusing point of porcelain. In other words, porcelain will fuse at a considerable temperature under what is nominally called its fusing point if it is given enough time. The furnace I am using is a low-temperature 2000-degree furnace, reaching 1750° F., which is recommended for the first baking, in about eighteen minutes. Silver foil fuses at approximately this temperature.

This baking causes the porcelain to sink into the cavity, but it does not draw away from the margins; which is quite important in this method of making inlays, because, if the porcelain draws away from the investment, it is very difficult to vibrate porcelain into this crevice and condense it. In a platinum matrix, it can be done, but not with the investment matrix. Because furnaces vary so much, and even the current varies at different times of the day, it is well to experiment with the furnace, to determine the correct time and temperature for this result. If this first baking is too high, the porcelain will draw away from the margin. The other chief cause of this condition is improper condensation.

SECOND BAKING

When the furnace cools to 500° F. or less, the inlay is removed and a second application of methylene blue made around the margins. The model is again wetted and placed in the matrix holder as before and porcelain applied to just the contour desired, with care to condense it thoroughly. It is now replaced in the furnace and carried to 1850° F. in about twenty minutes from a cold furnace. If this temperature is reached sooner, it may be necessary to hold it there for a minute or two to get the desired glaze. Twenty-two carat gold plate fuses at approximately 1850° F.

When the furnace has cooled, the inlay is removed from the investment by first wetting and then brushing with a stiff toothbrush. If care has been taken to keep the porcelain off the margins, there will be almost no overhang. If the inlay is held up to the light, we can see the overhang and can remove it with a fine sandpaper disk provided it is not excessive.

SETTING THE INLAY

These inlays fit so accurately that it is difficult to set them with "cryptex" or synthetic porcelain. If care is taken in blending the oxyphosphate cements, a very desirable result will be obtained. The blending can be done by mixing the cement with glycerine first and trying the inlay in the cavity with this mix. The cement is mixed about as for a gold inlay and carried into the cavity with an explorer. The inlay is forced to position with an amalgam plugger, to which the inlay has been attached with gutta-percha. The cement is allowed to set and the excess is removed. If there is any overhang, now is the time to remove it. This is done with stones and disks, and tin oxide is used for polishing. In most cases, however, going over the margin with a very fine stone will be sufficient, and the inlay will be finished.

4816 Northwestern Avenue.

LOCAL ANESTHETIC AGENTS USED IN DENTISTRY

By CHARLES W. FREEMAN,* M.S., D.D.S., Chicago, Ill.

THE development of local anesthesia as an essential in modern dental practice is an important chapter in the history of the profession. Many of us have observed the significant changes in office procedure resulting from the adoption of a satisfactory local anesthetic, and as we look back at the time when it was an innovation, we are astonished at the early hesitation of the dental profession in accepting its obvious advantages.

Procaine was introduced at about the same time as the casting method of making gold inlays, and certainly presented no more difficult technic for mastery. However, at the end of ten years, the gold inlay had been almost universally adopted, while local anesthesia was still in need of ardent missionaries to stimulate an interest in a procedure that was finally to be accepted, but only with hesitation and skepticism, by the great majority of practicing dentists. This skepticism was overcome, although somewhat belatedly, and local anesthesia is now employed routinely in almost every dental practice.

It is obviously true that the universal adoption of this method of eliminating pain has contributed to a remarkable improvement in the quality of professional service in extraction and other surgical procedures about the mouth. It has engendered an increased appreciation of the importance of an aseptic technic; it has almost entirely replaced all other methods in the painless removal of pulps, and it has become an extremely valuable adjunct in various procedures in operative and prosthetic dentistry.

A review of the literature on local anesthesia during the past thirty years leads to the observation that, in its development, there were three phases of interest and emphasis, each phase extending over a period of about a decade. In the first period after the introduction of procaine, the technic of administration was the paramount subject of most of the articles, and the discussion was concerned with the probability of success in using specific technics. In the second phase, we find general acceptance of the standardized methods, and of procaine hydrochloride as the agent, the discussion being principally concerned with the comparative advantages of local and general anesthesia for various purposes, with a gradual but decided trend in favor of local anesthesia.

During the past ten years, there has been an awakened interest in the agents and solutions employed, and their pharmacologic and clinical behavior. Clinicians and chemists alike have contributed in an almost frantic search for better local anesthetic products. Since it is improbable that any new method of administering a local anesthetic will be discovered, our hope of improvement in this field is practically limited to an improvement in the agents employed.

Strangely enough, the local anesthetic

*Dean and professor of oral surgery, Northwestern University Dental School.

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solution most frequently employed today is basically the same as that recommended by Fischer about thirty years ago, in spite of the great amount of clinical and chemical research in this field. He recommended a 2 per cent solution of procaine hydrochloride, with the addition of a small amount of vasoconstrictor, and salts to make an isotonic solution.

Many new agents have been produced, some at least as satisfactory as procaine hydrochloride, and some probably having certain distinct advantages, but none of sufficient superiority to replace the anesthetic that has been the one of choice for many years.

If we look back twenty years, we find that Smith,[1] in 1920, attempted to compile complete information on the subject, listing ten local anesthetic agents for injection. Only three of the ten are listed in the 1939 edition of Accepted Dental Remedies[2] and procaine hydrochloride is the only one of more than historic interest.

In New and Nonofficial Remedies[3] for 1930, eight local anesthetic agents are listed, but procaine hydrochloride is the only one now used extensively, although two others are of some interest in dentistry. In this publication, ten years ago, two brands of procaine hydrochloride are listed as accepted, the manufacturer of one brand producing eight accepted tablet forms and one ampule, and the other four tablet forms recognized in the list.

In the 1939 edition of Accepted Dental Remedies,[2] there are eleven local anesthetic agents for hypodermic injection, three of them salts of procaine, the other eight of little present professional or commercial importance.

When we consider the brands of procaine hydrochloride available in various tablet forms and in solution in containers, we see a marked change occurring in recent years. Six companies manufacture an accepted brand of procaine hydrochloride, and eighteen companies manufacture for sale to dentists thirty different trade products in sixty-six different solutions, in addition to twenty-three different tablet forms. This tabulation is made without reference to the size or style of containers, but lists only those solutions of different composition or made by different companies. One company has only three different accepted solutions, but they are marketed in twenty-one different sizes and styles of container.

This rather staggering total includes only the products accepted for listing in Accepted Dental Remedies, and we are all well aware that there are many unaccepted products on the market. We are justified in a distinct feeling of satisfaction that the American Dental Association, through the Council on Dental Therapeutics, has protected us to the extent of surveying and examining the products available, and listing those that meet with approval. Certainly, with such a number of accepted products from which to make selection, there is little excuse for using unlisted products except on the experimental basis.

We may pertinently raise the question whether it is good practice economically to have such a variety of solutions with slight variations in composition, since we who purchase are the ones who pay the extra cost of the multiplicity of containers and solutions, as well as the cost of the expensive advertising programs. On the other hand, the keen competition in this manufacturing field has increased the effort, at least on the part of some manufacturers, to produce a better product.

The use of prepared solutions in sealed containers has certain advantages of convenience and uniformity, but there is a corresponding disadvantage in that the practitioner is inclined to disregard the actual contents of the package and use Company K's solution X on the recommendation of the dealer or because of a convincing advertising campaign, rather

than as a result of his own knowledge of the desirable ingredients of the package.

It is my opinion that no manufactured prepared solution can be so satisfactory as a freshly made one in which the dentist knows what agents he is using and why he selected them. I recognize the fact, however, that the indifferent dentist who is concerned principally with convenience can obtain a reasonably satisfactory solution ready for use, and I believe the products available today are much better and safer than they were a few years ago.

The sterility of packaged products must always be a matter of concern, and while some studies have shown contamination with non-pathogenic organisms in a few instances, the manufacturers have, it is my belief, made distinct progress in producing sterile solutions. No less important in assuring sterility is care in handling the material and equipment in the dental office, and while it is possible to use the carpule syringe with no break in the chain of asepsis, I question whether the usual office routine is sufficiently meticulous in this regard. It is so much less trouble to cut the corners a little that it should be a matter of concern to every dentist to examine his procedure from time to time to ascertain whether he is doing as well as the manufacturers have done in eliminating the possibility of contamination.

The mechanism by which a local anesthetic agent acts on the nerve is not entirely understood, but research in this field has brought some clarification. It is generally accepted that the anesthetic base, which is soluble in lipoids, is the effective agent. Since the anesthetic base is not soluble in water, the only convenient method of preparing it in a solution for hypodermic injection is to combine the base with an acid to form a water soluble salt. The most commonly used salt is the hydrochloride of procaine.

When this is made into an aqueous solution, some hydrolysis takes place or the salt dissociates to liberate a certain amount of the free anesthetic base. Since the amount of free base liberated depends on the number of hydroxyl ions present, the pH of the solution is a direct factor in determining the amount of free base.

The liberation of the free base may be regulated by two methods, the end-result being the same. Alkali can be added to the procaine hydrochloride solution to combine with the hydrochloric acid and liberate the free base, or a weak acid such as boric acid can be combined with the procaine base to form a salt with a high pH, the natural hydrolysis of the salt of a weak acid liberating the free base.

Solutions with a high pH are less stable because the free base is easily oxidized, and more free base exists in alkaline solutions. Another factor is the vasoconstrictor present, most vasoconstrictors being quite stable at a low pH, but oxidizing quite rapidly in an alkaline medium.

Consequently, the alkaline salts of procaine or procaine hydrochloride which has been made alkaline are not stable, and should be freshly prepared. Sterilization by heat increases the oxidation of the procaine and the epinephrine more noticeably in an alkaline than in an acid solution.

On the other hand, the advantages from using an alkaline or at least a less acid solution are considerable. The rapid dissociation on injection permits the anesthetic base to act rapidly on the nerve, and anesthesia is obtained more rapidly. This fact has been pointed out many times by my collaborators and others, and while some studies have been made in challenge, clinical experience, I am sure, supports it. At the time these studies were begun, we searched the literature and could find no reference to successful mandibular injections being

made in less than fifteen minutes, while we consistently produced satisfactory mandibular anesthesia in two or three minutes.

The principal advantage of the neutral or alkaline anesthetic solutions is that they more nearly approach the pH of the tissues and may logically be expected to cause less local irritation because the local tissues are not required to sacrifice their alkali to neutralize the acidity of the solution.

We recognize that a reasonable variance between the pH of the solution and that of the tissues into which it is injected is easily compensated by the buffering action of the tissue juices, but we cannot accept the postulation that injection of several cubic centimeters of a solution with a pH much below that of blood can be made without placing a distinct burden on those tissues. This is more notably true when the solution is injected into fixed tissue, where the blood supply is immediately reduced by the vasoconstrictor contained in the solution.

Tainter *et al.*[4] made a careful clinical study of the comparative value of procaine hydrochloride pH 5.6 and procaine borate pH 8.1, in which they drew the conclusion that "procaine borate offers no real worthwhile advantages over procaine hydrochloride."

Their scientific approach to the study cannot be questioned, but they used 4 per cent procaine borate and 2 per cent hydrochloride in order to obtain the same molar concentration of procaine base. Since procaine borate is usually used in 2 per cent and even in 1 per cent solutions, this partially invalidated their findings. While they found no great difference in the clinical results, the procaine borate showed a shorter average time in onset, a longer anesthesia, a larger percentage of complete success and a larger percentage of patients with no pain on injection and a smaller percentage with late reaction at the site of operation. These differences were all very slight, and all were in favor of procaine borate.

On the other side, procaine borate showed less favorably in cases of nervousness, tremors and fainting, and a late reaction at the site of injection. This may be accounted for by the fact that an unusual amount of free base is present in a 4 per cent solution, with consequent rapid absorption. My own experience would indicate that the reported result in 11 per cent of the cases of fainting and 20 per cent of a late reaction at the site of injection is entirely out of line with reasonable expectation, and if I had similar clinical results, I certainly should abandon the anesthetic.

My own experience with systemic reactions and postinjection disturbances has been exactly the opposite, the use of a 2 per cent alkaline local anesthetic having reduced these complications almost to the vanishing point, even in an extraction clinic where many extraneous conditions tend to disturb the patient.

There is not sufficient scientific evidence as to the difference in local and systemic disturbance between acid and alkaline solutions, but we now have a background of ten years of satisfactory clinical experience with alkaline solutions, and we believe that there is definitely less postinjection disturbance and less general systemic reaction than with acid solutions. We have not yet found a more satisfactory solution than one freshly prepared with procaine salts and with a pH that does not vary more than 1 from that of the blood.

The pH of 2 per cent procaine hydrochloride in fresh solution is about 5.6, which is considerably lower than the pH of the blood and body tissues. While we believe that this is too low, it is still within reasonable range, but many of the manufactured solutions are found to be much more acid, to enhance their stability, or because the pH has been reduced on standing. It is possible that some of

the solutions are manufactured with a low pH, but it is more probable that the pH is lower because the solutions have been allowed to stand. Sulfites are used to prevent oxidation of the epinephrine, the protection being due to the fact that the sulfites oxidize more readily. After oxidation of the sulfites, the salt formed is more acid, and this may account for the low pH of some samples.

Grossman,[5] in 1937, found the pH of many stock solutions to range from 3.9 to 7.5, most of them being below 6. In ten stock solutions taken at random from the dealers' shelves last month, I found the pH to range from 3.2 to 4.9. It appears to me that for a dentist to use solutions with such a low pH is highly undesirable, and can be expected to result in unnecessary complications.

The regulation of osmotic pressure by the use of isotonic solutions has been a matter of discussion for many years, and the addition of sodium chloride or Ringer's salts has been almost universal. In the days when dentists prepared their own solutions by adding tablets to Ringer's solution, they almost invariably produced a hypertonic solution because they did not calculate the effect of the procaine salts. The addition of 2 per cent procaine salts to distilled water furnishes about half the salts necessary to make an isotonic solution; and our clinical observations indicate that a hypotonic solution causes less irritation than one that is hypertonic. Consequently, in preparing fresh solutions, we disregard the addition of salt and do not attempt to make the solution exactly isotonic.

It is presumed that the manufacturers calculate their stock solutions exactly, although Ellingham[6] tested the freezing point of several stock solutions and found most of them hypertonic, some very seriously varying from normal as determined by the freezing point.

The various substitute local anesthetic agents that have been produced over the past ten years require little discussion. None so far have been found to be sufficiently superior to the procaine salts to warrant adoption. The same may be said of substitutes for epinephrine: that some have about equal value, but none have been proved superior.

In our studies at Northwestern University Dental School, we have examined several salts of procaine as well as procaine hydrochloride made alkaline by the addition of a variety of alkalis. We have studied nupercaine, panthesin, thiocaine and monocaine and have made some investigation of the substitutes for epinephrine. In general, we have reached the following conclusions:

1. The salts of procaine are the most satisfactory local anesthetic agents available at present.

2. It is desirable to use a solution with a pH as near that of the blood as is practical.

3. Freshly prepared solutions in distilled water of (a) 2 per cent procaine borate or (b) 2 per cent procaine hydrochloride plus 0.1 per cent of sodium carbonate are satisfactory.

4. A vasoconstrictor, in as low concentration as is practical, increases the efficiency.

5. A solution may safely be hypotonic, but hypertonicity is undesirable.

6. The buffering action of tissues and their ability to recover from injury has made it possible to use solutions far from satisfactory without very serious consequences.

7. It is possible, and probable, that a better local anesthetic agent may be produced, one with low toxicity and a pH close to that of the blood, with slight vasoconstrictor effect, and one that is rapid in action.

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SULFANILAMIDE THERAPY PERTAINING TO DENTISTRY

By CLYDE BENJAMIN KAYNE, D.D.S., West New York, N. J.

CONSIDERABLE interest has been manifested by the dental profession in the drug sulfanilamide because its mode of action renders it applicable in the field of dental surgery.

In 1935, observations on the protective action of a synthetic azo dye in artificially produced streptococcic infections in mice were made. This dye was known as "prontosil." Similar results were observed with a related compound, which had the added advantage of being more soluble and which became known as "prontosil soluble."

The first investigations on these compounds brought out some interesting facts concerning their mode of action. In the test tube, or in contact with culture media containing viable organisms of known potency, the drug showed only mild bacteriostatic activity. In the animal body, on the other hand, the same organisms disappeared from the body fluids soon after administration of the drug. It was subsequently shown that prontosil is reduced in the body with the formation of a compound which is known chemically as para-aminobenzensulfonamide, and termed sulfanilamide.

The present conception of its mode of action is that it inhibits the multiplication of susceptible organisms, an effect termed bacteriostasis, permitting the phagocytes to dispose of the organisms before they exert a lethal effect. It does not possess any bactericidal power upon any organisms present. It does not promote phagocytosis. It does not affect the capsule of encapsulated organisms. It does not affect the virulence of any organisms.

The drug is readily absorbed and quickly diffused through the tissue by any route of administration. Because of its ready diffusibility, it attains a wide distribution, having been found in the cerebrospinal fluid, pleural fluid, prostatic secretion, saliva, pancreatic juice and bile in concentration slightly lower than that of blood. On the other hand, the heart muscle, skeletal muscle, liver, lung and spleen contain a concentration nearly equivalent to that of the blood; whereas the skin and brain contain less, and bone and fat only small amounts. It also penetrates the pus in closed abscesses, being found in purulent discharges. In the treatment of purulent infections, it has been noted that recurrences are frequent, if sulfanilamide is discontinued before a complete clinical cure has been effected; therefore, the drug should be continued for at least ten days after the patient is completely well. This fact has led to the use of the drug in nearly all types of inflammation involving the above-mentioned secretions.

Of prime importance in establishing a rational basis for therapy is the ability to correlate the concentrations of the

drug in the blood with the clinical improvement. The efforts of E. K. Marshall, Jr., and his associates resulted in development of a means of determining the sulfanilamide content of the blood and urine, as well as spinal fluid, saliva, bile, pus and ascitic fluid. They found that the amount in the blood rises about as rapidly when the drug is given by mouth as when given parenterally. The absorption peak is reached in from three to four hours, and then begins to decline, so that, in twenty-four hours, nearly all of it has been excreted, except in case of renal impairment. In the acutely ill, it is essential to give a large dose and then repeat doses at four-hour intervals, in order to maintain the level at 10 mg. per hundred cubic centimeters, if possible.

Several days is required to establish the equilibrium between intake and output, but when it is established, 100 per cent of the intake of the drug can be recovered in the urine. After discontinuance of the drug, about three days is required to obtain total elimination with normal function. It is noteworthy that the drug concentration is only slightly lower in the cerebrospinal fluid than in the blood and is attained at about the same time. An important observation is that the maximum bacteriostatic effect is reached about forty-eight hours after the effective therapeutic blood concentration is attained.

In adults weighing 100 pounds or more, Long advocates an initial dose of from ten to fifteen 5-grain tablets. From then on, three 5-grain tablets are given every four hours, with from 10 to 20 grains of sodium bicarbonate.

The dose should be diminished for smaller children. However, it must be kept in mind that the amount of sulfanilamide per pound or kilogram of body weight required to establish adequate levels of the drug in the blood of children is considerably greater than that needed in adults. This variation is due to the fact that the fluid intake per kilogram of body weight is normally greater in children than in adults, and when fever is present, this difference is even more marked. Sulfanilamide is excreted almost entirely in the urine. Thus, the greater the volume of urine, the greater the excretion of sulfanilamide. This fact must be taken into consideration in prescribing for children. As improvement occurs, the dose is gradually reduced.

If the patient is an adult and is unconscious, an initial dose of 700 cc. (100 cc. of prontosil contains 11 grains of sulfanilamide) of an 0.8 to 1 per cent solution is given subcutaneously, followed by 500 cc. at eight-hour intervals during the first twenty-four hours. For children weighing from 50 to 90 pounds, the initial dose should be from 300 cc. to 500 cc., followed by from 200 cc. to 300 cc. at eight-hour intervals. Babies should receive 1 gm. of sulfanilamide for 10 pounds of body weight during the first twenty-four hours. As the patient begins to improve, these large doses of the drug should be reduced, the doses being cut to about two-thirds of the original amount and then to about one-third.

TOXIC EFFECTS

Careful administration of sulfanilamide is necessary at all times since the drug may present any one of several definite toxic effects.

1. *Cyanosis.*—Cyanosis following sulfanilamide therapy may be attributed to the presence of either methemoglobinemia or sulfhemoglobinemia.

Sulfanilamide is capable of causing acidosis-producing methemoglobinemia in a considerable percentage of individuals taking large doses of the drug. In the majority of human beings, the administration of sulfanilamide brings about a fall in the serum sodium and potassium and a corresponding rise in the excretion of these substances in the urine, with a resulting fall in carbon dioxide combining power for the plasma. When sodium bicarbonate and the amide form

of nicotinic acid are used, cyanosis due to methemoglobinemia is definitely reduced or entirely disappears.

Of the possible dangers attendant upon sulfanilamide therapy, the occurrence of sulfhemoglobinemia is probably the most important. Sulfanilamide is believed to assist in the combination of the free intestinal hydrogen sulfide with hemoglobin, possibly through p-acetylaminobenzenesulfonamide, the compound formed in the body in sulfanilamide medication. It may be well to note here that from 10 to 20 per cent of the drug is conjugated in the tissues to produce the acetyl form.

In the presence of sulfates of any form, notably from the administration of magnesium sulfate, concurrent with the administration of sulfanilamide, sulfhemoglobinemia develops. Sulfur itself should be avoided. So too should preparations, such as liquorice powder, which contain it. Owing to the hydragogue action of most aperients and laxatives, e.g. salines, it is best to prohibit their use, as obviously hydrogen sulfide is more easily liberated when the contents of the colon are liquid. The use of aniline derivatives, such as phenacetin and acetanilide; of phenylhydrazine derivatives, such as phenazone and amidopyrine, and sulfonal and methysulfonal should be avoided during treatment with sulfanilamide. When renal function is impaired, the compound should be given with care, as it will be excreted more slowly, and an accumulation may be dangerous.

Sulfhemoglobinemia is a serious complication in a sick patient, for it represents a permanent loss of the blood involved. Spectroscopic examination and hemoglobin determinations of the blood are the most reliable means of differentiation of the cause of cyanosis. Sulfhemoglobinemia may persist six weeks after treatment has been discontinued.

2. *Bone Marrow Depression.*—Since sulfanilamide is essentially a substituted aniline, the presence of the hemolytic properties of the benzene structure is obviously possible.

(a) Erythrocytic: A hemolytic anemia may result which is quite striking in its resemblance to the hemolytic crisis arising from the use of phenylhydrazine. The blood picture itself shows a sharper decrease in the number of erythrocytes, with a proportionate decrease in the amount of hemoglobin, evidence of both erythrocytic regeneration and destruction, together with leukocytosis.

(b) Leukocytic: Cases of leukocytic depression are being reported, varying from a mild leukopenia to a complete agranulocytosis. Sulfanilamide, from its chemical structure, is a potential marrow poison; therefore, treatment should be guided by blood counts whenever possible.

3. *Skin Manifestations.*—As with any chemotherapeutic agent, the possibility exists of the occurrence of typical allergic phenomena of the skin. Confirmatory of this are the reports of urticaria following the use of sulfanilamide. However, the most frequent cutaneous manifestation following sulfanilamide therapy is a maculopapular eruption identical in appearance to measles, with intense itching and fever. The rash usually appears on the ninth or tenth day of treatment and disappears about thirty-six hours after withdrawal of the drug. In addition to the toxic erythema, purpuric phenomena have been reported, indicating that sulfanilamide possibly possesses vasculotoxic properties. Another interesting, but unexplainable skin manifestation is a photosensitization present in certain cases, rendering the patient extremely susceptible to sunlight.

4. *Nervous System Manifestations.*—In most instances, the administration of sulfanilamide has a distinctly depressing effect. Headache, dizziness, lassitude and general malaise are of common occurrence. The mental confusion often present is said to be of the same character as the toxemia produced by ethyl alcohol. For this reason, alcohol is contraindicated during sulfanilamide therapy, as it tends to accentuate the

cerebral toxic manifestations. Patients who are receiving sulfanilamide should be warned against driving automobiles because dizziness and decreased mental acuity in many cases render the driver dangerous on the road.

5. *Gastro-Intestinal Tract Manifestations.*—The gastro-intestinal tract is frequently affected, manifesting an idiosyncrasy by nausea, vomiting, abdominal pain and diarrhea. Depressed hepatic function is occasionally recognized through the bromsulphenophthalein excretion test.

6. *Simple Fever.*—This condition, unaccompanied by other toxic manifestation, has occurred quite frequently. Often, it is necessary to differentiate the fever due to the drug therapy from that due to the infection. It is interesting to note that patients usually have one or more days of normal temperature before they develop fever from the drug action. In testing for recurrence, a small dose, about 5 grains, should be administered to ascertain whether the fever symptoms will recur.

The treatment of severe toxic effects aside from the withdrawal of the drug consists of forcing fluids; blood transfusions, particularly in leukemia, hemolytic crises and sulfhemoglobinemia, and the administration of oxygen, sodium bicarbonate, and the amide form of nicotinic acid when cyanosis is due to methemoglobinemia alone.

An important point to remember is that this drug does not possess any antitoxic properties; therefore, it does not replace streptococcic antitoxin. Although, in most cases, it causes recession of the fever, the toxic symptoms, other than fever, persist, and the usual methods of combating toxemia must be employed.

In dentistry, sulfanilamide may be used as a local application, after extraction, 5 grains of the crystalline form being inserted directly in the sockets. After surgical procedures, such as extirpation of cysts, apicoectomy and alveolectomy, several grains in powder form are sprinkled into the wound before suturing. It may also be used in compound fractures of the jaw. I have applied as much as from 30 to 40 grains directly in the wound in these cases, with excellent results.

Sulfanilamide is of invaluable aid when administered intra-orally for acute abscess, cellulitis and osteomyelitis. In osteomyelitis, clinical observation has taught us that the drug must be continued for at least two weeks after apparent resolution, as otherwise relapses are frequent. In these conditions, we must follow the dosage as outlined above and at the same time be mindful of the several toxic reactions of the drug. For this reason, collaboration with the physician is advisable.

Properly administered, sulfanilamide is a great asset in the field of dental surgery.

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561 Bergenline Avenue.

THE INFLUENCE OF IMMUNOLOGIC FACTORS ON DENTAL CARIES

By THOMAS J. HILL,* D.D.S., Cleveland, Ohio

INVESTIGATION of the causative factors of dental caries has dominated all dental research for the past decade. Many theories, each supported by varying degrees of evidence, have been advanced, attempting to solve this difficult problem. At the present time, it appears that the cause of dental caries is a complex problem with numerous major and minor factors.

From the mass of evidence presented, one fact stands out prominently: Dental caries is associated with the growth of some form or forms of bacteria. This fact furnishes the common basis upon which any discussion of immunity and resistance is predicated. As early as 1910, Goadby[1] recognized that there are conditions which influence the character of the mouth flora, and that, concurrently, there is a variation in the rapidity of the carious process. He associated with rampant caries oral flora containing a high percentage of aciduric organisms. Later investigations have presented evidence of many other factors which have complicated rather than simplified attempts at understanding the disease.

It is evident that the bacterial picture of deep caries of the dentin is different from that of early decalcification of the enamel upon the surface of the tooth. The Michigan group[2] has demonstrated that a high incidence of *L. acidophilus* in the saliva is a reliable indicator of active enamel decalcification. Blayney's[3] study of the qualitative changes in film smears in beginning decalcification is an impressive demonstration of the forms of bacteria associated with early caries. His method is suggested as a relatively simple office procedure which may be used as a valuable aid in determining the value of efforts toward the localized control and prevention of dental caries.

There is ample evidence to support the theory that caries-susceptible and caries-resistant mouths have a different bacterial content. It has, however, been difficult to establish the reason for this difference. Experiments with diet have produced extremely conflicting evidence and, in the last analysis, have not conclusively proved that diet as a nutritional influence is as important as its direct influence on the growth and multiplication of oral bacteria. The Michigan group[4] has shown that reduction of carbohydrates materially reduces the number of *L. acidophilus* organisms in a large majority of mouths, but this group also admits that there are some persons in whom reduction of carbohydrates does not materially reduce the number of *L. acidophilus* and others in whom the addition of carbohydrates does not materially increase the number of these organisms. The latter group of individuals is free or relatively free from *L. acidophilus* and also free from active dental caries. It is this group that is sometimes spoken of as "natural immunes."

Resistance to bacterial invasion or destruction of the invaders has been ex-

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*Professor of clinical oral pathology and therapeutics at the Western Reserve University.

tensively studied. Cells of the blood and of the body can and do destroy bacteria and certain other parasites. Substances in the blood and body fluids, the so-called humoral factors, influence the action of cells and may independently inhibit or kill bacteria. There is no adequate reason for believing that the susceptibility to caries is altered by cellular activity in the mouth or the saliva. Thus, humoral mechanisms must be active in the "natural immunes." The problem, then, is whether the inhibitory substance in saliva is furnished to it directly from the blood or is in some way built up in the saliva. There is meager evidence to support the idea that the blood contains the factors of resistance; i.e., that there is a true humoral immunity. If the factor is produced in the saliva, there is no true immunity as applied to the body as a whole, but a local manifestation somewhat allied to it. The evidence in favor of these views is presented in this paper.

If bacteria are the active agents in acid decalcification of the tooth surface, it must be assumed that any humoral resistance of the host must act through the medium of the saliva, which constantly bathes the tooth surfaces. The chief difficulty in the investigation of this aspect of the problem is a lack of suitable laboratory animals. The disease commonly occurs only in humans, and man, even under favorable conditions, is a poorly controlled experimental animal. The artificial production of caries in experimental animals is accomplished with regularity only when the diet, although satisfactory as to calories and vitamins, is such that food substances accumulate in the sulci of the teeth; for example, the Hoppert diet of coarse particles which accumulate and pack in the occlusal grooves and pits. Laboratory animals are normally free of dental caries and the presence in their saliva of *L. acidophilus* is only sporadic.

The observation that in man caries is prevalent in mouths having thick ropy saliva is of long standing. It has also been observed that such saliva is below the average in quantity. Trimble, Etherington and Losch,[5] in a year's examination and observation of dental students, observed that those students having an output of saliva below average in amount had 19 per cent more cavities than those secreting greater quantities of saliva. The mechanical influence of such diminution of saliva is recognized, and it also serves to focus attention on the saliva itself.

The writer[6] has reported a study of the influence of saliva upon the growth of *L. acidophilus,* showing that these organisms, if added, with 2 per cent dextrose, to centrifuged or filtered saliva from a caries-resistant mouth, will not grow. On the contrary, in cultures made of saliva from caries-susceptible mouths and treated in the same manner, the organisms planted not only will be sustained, but also will multiply actively. This would indicate that caries susceptibility is to some extent due to the presence in or absence from the saliva of some substance which is inhibitory to the growth of *L. acidophilus.* It is also possible to make saliva from caries-resistant mouths a suitable culture medium for growth of *L. acidophilus* by the removal of this inhibitory substance, which is accomplished by placing in the saliva dead *L. acidophilus* organisms, and then removing them by centrifuge, and adding 2 per cent dextrose and a known quantity of live organisms. That this inhibition is the result of the presence of quantitive amounts of the substance in the saliva is shown by the fact that when saliva from caries-susceptible and from caries-resistant mouths is mixed, the ability of the resulting saliva to support the growth of *L. acidophilus* is in proportion to the amounts of resistant and of susceptible saliva used.

It should not be assumed that the presence or absence of *L. acidophilus* in the human mouth is entirely dependent

on this factor. It is necessary to add sugar to any human saliva to make it a suitable culture medium for these organisms; consequently, the addition of sugar to the diet must play an important part in oral growth of *L. acidophilus*. This would be particularly true in those who are susceptible or on the borderline between the caries-free and the caries-susceptible group. However, the fact that the saliva of individuals who are strictly caries-resistant contains some substance which inhibits the growth of these organisms even when sugar is added may explain why these people are not materially affected by a large carbohydrate intake.

It is interesting to note that the saliva of dogs which are normally free from caries, even when sufficient dextrose is added to make a 2 per cent solution, is a poor medium for growth of *L. acidophilus*. Fish and McLean[7] expressed the belief that the susceptibility of humans to dental caries depends, in part at least, on their susceptibility to the organisms concerned. Carious human teeth from which they had cultured *S. mutans* were transferred to the mouths of a dog immune to caries and a monkey that had caries. The dog's saliva killed the organisms in the carious tooth in from two to four days; but, from the monkey, which had caries of its own, the organisms could be recovered from the carious human tooth after eleven days.

White rats under normal conditions are relatively resistant to dental caries. Lilly[8] fed rats a diet that was normal except for the fact that it contained 53 per cent sugar. These rats received triweekly oral inoculations of *L. acidophilus*. At the end of one year, they were free from dental caries. While Lilly frequently made oral inoculations of *L. acidophilus*, he makes no reference to the success of the implantation. Jay[9] fed rats food mixed with 48-hour cultures of *L. acidophilus* and was unable to make a successful oral implantation of the organism. In these animals, caries did not occur. It is evident from these experiments that the implantation of *L. acidophilus* is, without successful growth, insufficient to produce caries. It is also evident that successful implantation does not depend alone on the presence of sugar, but also on other factors in the medium in which it is implanted.

From these facts and similar evidence that could be recited, it seems apparent that, in the mouths of both man and animals, the presence or absence of *L. acidophilus* is not only correlated with the incidence of dental caries, but is also associated with some factor in the saliva which favors or inhibits its growth. Any such factor of the saliva, if related to immune phenomena, must be liberated into the saliva from the humoral substances of the blood. It has been shown that antitoxin and agglutinins may be liberated in this manner, but while resistance to the growth of oral *L. acidophilus* may be a specific factor, its presence in the blood and its liberation into the saliva have not been demonstrated. However, there are some studies which lend support to that hypothesis.

HEREDITARY INFLUENCES

Through observation of individuals, an apparent familial resistance has long been clinically recognized. Isolated primitive races, which are relatively free from dental caries, also have been under repeated observation. In this instance, the hereditary factor has been obscured by the associated dietary habits of these people. There has been a great divergence in the views of authors relative to the part heredity plays, but some statistical evidence of a possible association has been presented. In an examination of 4,416 white children of Hagerstown, Md., Klein and Palmer[10] divided the dental records into those of caries-resistant and of caries-susceptible groups. The records of brothers and sisters were then assembled and analyzed to show the

level of caries in the contrasting groups of siblings. The analysis showed the susceptible siblings to have more than twice as many cavities as the resistant siblings. Hunt and Hoppert[11] have made preliminary reports on their ability to produce strains of rats which are susceptible or resistant to dental caries while on the Hoppert diet. These strains were produced by inbred lines of mated siblings from groups which showed early or late development of caries. This work has not been reported in full, but a preliminary report indicates significant familial differences.

L. ACIDOPHILUS AGGLUTININS

As early as 1925, McIntosh, James and Lazarus-Barlow[12] demonstrated the presence in the saliva of *L. acidophilus* agglutinins. They made no attempt to correlate the presence of these agglutinins with the absence of caries, but found that in 1:5 dilutions of salivas of ten patients, five gave complete agglutination, two partial and three none. The agglutination decreased rapidly in dilutions greater than 1:40. In an attempt to produce dental caries, they fed a monkey broth cultures of *L. acidophilus* and they were successful in raising the salivary agglutinin titer to 1:160. However, the authors were of the opinion that the strength of the agglutinin titer was insufficient to make it a protective barrier.

Ross, Krasnow and Samet[13] attempted to immunize rabbits by inoculation with *L. acidophilus* vaccines and subsequently were able to demonstrate the presence of acidophilus agglutinin in both the blood and the saliva of one-half of the animals inoculated. The agglutinins in the saliva were in much lower concentration than in the blood serum, and they believed it was of doubtful value but that it demonstrated an immunologic principle. Agglutinins given off in the saliva could not be expected to be maintained in high concentration without exhaustion of the blood serum agglutinins. It is possible that a low concentration of agglutinins in a fluid which is constantly replaced may have a relatively high efficiency.

Jay[14] tested the blood sera of caries-resistant and caries-susceptible groups for *L. acidophilus* agglutinins. In a group of twenty-three caries-free individuals, all reactions were positive for the presence of some agglutinin, the highest titer being 1:640. In a group of twenty-five caries-susceptible individuals, the majority gave negative agglutinin reactions and the highest titer was 1:80. The consistent presence of *L. acidophilus* agglutinins in the serum of the caries-resistant and the usual absence of it from the caries-susceptible appears significant as it would indicate that some relationship exists between the blood and the presence of *L. acidophilus* in the mouth. The same author attempted skin reaction tests by the intradermal injection of *L. acidophilus* filtrates. The majority of the susceptible gave positive reactions and the majority of the resistant gave negative reactions. Attempts to raise the agglutinin titer of the susceptible by subcutaneous inoculation of the filtrate were not successful, although two individuals did have a temporary increase in agglutinin titer.

Macphee[15] made some interesting observations of the immunologic reactions to dental caries. By the use of an antigen made from filtered saline emulsions of carious dentin, he demonstrated a precipitin reaction with blood serum. He describes this reaction as "definite and convincing," although feeble in character, and he believes that the antigen should be fortified or a more specific amount of carious material be substituted. He describes a definite correlation between the degree of precipitin reaction and the clinical presence or absence of dental caries, the reaction being more pronounced in sera from individuals free from carious teeth. He further demon-

strated a positive complement-fixation test by using dentin of the teeth as an antigen. This complement fixation was more pronounced if the antigen was from carious dentin than if from normal dentin. He found no relation between these reactions and the results of Wassermann tests on the same individuals. When this test was applied to serum from the individuals used for the precipitin test, a definite correlation was found. He concluded that these tests bore a definite relationship to caries and were indicative of the patient's state of susceptibility.

It is difficult to understand how organisms growing upon the surface of a tooth could react in a manner to constitute a true immune resistance. If such a reaction occurs, it would be necessary that there be absorption of either the products of bacteria or the products of enamel and dentin decomposition. This again raises the disturbing question as to whether absorption is possible through the hard structures of the tooth or must occur through the soft tissues. At the present time, these questions cannot be answered. It is evident that there exists some condition of the saliva which materially influences or controls the general nature of the mouth flora. It has not been shown, but it is suggested that this might be the result of some immunologic reaction because there apparently is some relationship between the presence or absence of dental caries and reactions of the blood serum. Neither has it been shown that such resistance, either immunologic or otherwise, is specific for *L. acidophilus* or any other organism which may be associated with dental caries. There is sufficient evidence, however, to make this a promising field for future investigation.

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2085 Adelbert Road.

PSYCHOLOGY APPLIED TO DENTAL TREATMENT OF ADOLESCENTS

By WALTER C. MCBRIDE, D.D.S., Detroit, Mich.

ONE day, a 14-year-old boy came into my office for dental service, accompanied by a boy friend of approximately the same age, who waited in the reception room during the appointment hour. My patient had been coming in regularly from 4 years of age until he had theoretically grown up, although on this occasion he had not been in to see me in two years.

On completion of the work, and when making the next appointment, my assistant overheard a conversation between the two boys, while they were putting on their coats, in which the friend ridiculed my patient for coming to a so-called "kids' dentist," the response being a monosyllable acquiescence. The next morning, bright and early, I was called to the phone to hear this apparently rehearsed request, "Doctor, I wonder if you'd mind if I didn't keep that appointment for next Friday. I had a friend with me the other day who goes to an awfully good dentist in the Stroh Building, and I would like to go to him too, if you don't mind." Naturally, I agreed that it was the thing to do and canceled the appointment. I liked the courtesy of the boy, as well as the thoughtfulness of the parent, for I was certain, from my knowledge of the family, that the mother and father agreed to the boy's plan to go to another dentist—a dentist for adults—provided he made his own overtures to me, and canceled his appointment.

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In the years between 12 and 14, much happens to a boy's emotions. When he begins to feel uncomfortable in the office of a pedodontist, arranged for younger children, he has arrived at the age of adolescence, regardless of his chronologic age; and when a girl, slightly older in most instances, becomes self-conscious in the same office, she too has reached adolescence. I have never dismissed a patient because of an arbitary age limit. Boys leave me—just fail to return—around 12 or 14 years of age, and girls at about 14 or 15. A girl's pride evidently does not develop at quite such an early age as the boy's.

Adolescence is defined by Webster as the period between puberty and maturity; in males generally considered as the period between 14 and 25, in females as 12 to 21. The wide range that he gives the age limits has been the subject of disagreement.

CONDUCT OF THE OFFICE

Granted there are no rules by which to manage adolescents or children in general, there are a few simple suggestions that may be made.

From the viewpoint of office etiquet, it is wise to dismiss from the operating room the fearful and oversolicitous mother. Not every parent, since for every one who fails miserably in the behavior problems of her children, there are countless numbers who do an exceedingly good job, and whose presence in the room helps rather than hinders. But we should exclude from the operating room the parent who narrates the illnesses, lists the shortcomings and stresses

the nervousness of the child in the chair; the parent who endeavors to interest the patient by distractive comment or suggestions; the parent who irritates both the child and the operator with ostensibly helpful chatter, repeating the operator's directions as to when to open the mouth, and when and when not to spit, etc.; the parent who attempts to bolster the child's courage and endurance by prevaricative comment, as well as the one who, by look or with voice inflection, conveys to the child the agony she is enduring with him.

To these might be added the mother who is chafed by the apparent unresponsiveness of her child. All parents—you and I alike—are so anxious to have their children set a shining example that they become impatient with juvenile and slow responses. Clifford D. Sweet, pediatrician, pays a tribute to children of such parents:

> A child's reaction time between suggestion or command and execution is longer than that of adults. Frequently when I ask a child to do something which I am certain he intends to do willingly, as soon as he can comprehend and carry out my wishes, he is stung into a refractory state by the querulous commanding voice of his parent, saying, "Why don't you do what the doctor asks? Now do it immediately." All children can appear to be completely absorbed with their own affairs and yet be fully aware of every word and act of those about them.

In the conduct of an office, it is well to keep out of the operating room unnecessary equipment and keep out of sight all fear-inspiring instruments. Unnecessary equipment, the x-ray machine, the gas machine, perhaps the sterilizer, the electric furnace, the casting devices, etc., are but additional things to cause perplexity to an apprehensive child.

Extraction instruments kept in the cabinet until the actual time of use are assuredly less fear-inspiring than those laid out on the tray long in advance, for the patient to see. Even such a procedure as preparing the syringe is disquieting if carried out directly before the patient. Anesthetics can very easily be prepared out of the child's range of vision; and to further eliminate the fear aspect of an impending injection, I thrust the needle in a cotton roll when placing it momentarily on the tray, and I carry the syringe to the mouth with the needle sheltered in the cotton roll, removing it, with the other hand, just prior to the injection.

Perhaps, in the conduct of the office, at least an attempt might be made to eliminate the characteristic dental office odor. I am certain that every one can recall the odor—from carbolic acid and creosote, particularly—characteristic of the first office entered as a child. Certainly, it is distinctive and conveys to many patients the suggestion of danger and fear associated with ether fumes and lysol in hospitals.

There are many deodorizers and atomizer solutions available today that can be used to eliminate or replace these offensive odors, not to mention the improvement provided by care to keep medicine bottles well stopped and the immediate removal of spilled medicaments. Even scented soaps, suggesting cleanliness and freshness, give an impression of clean office procedures.

MANNER OF OPERATOR

As for what the operator may lend to the management of adolescents, perhaps an attitude of self-assurance is most important. Many children come to me with histories of having been under the care of one, two or three dentists, with poor results, yet I find these patients tractable and well-mannered in my chair. Why? It is, I believe, because I present an attitude of assurance.

It is habit with me to approach the child with all the apparent decision that I can muster, and, incidentally, I have collected a great deal of this valuable veneer. Many times, students in our clinic

call me to assist them with a difficult patient, and after a moment or two of examination, a few words to the student and, perhaps, a casual yet definite suggestion to the patient, I can begin to operate without demur from the child. The student, following me away from the patient, may ask, "What did you do or say that I didn't do or say?" to which I always answer, "Nothing in particular, but you overlook the point that I am not afraid of the child and you are—and the child knows it." So many dentists are afraid of small children. Some act as if they were afraid to ask a child to do something lest he refuse and they should not know what to do next.

One's deliberate and even-tenored approach to a child may well be accompanied by the use of a slow motor in operating. Children become terrified at a fast motor and the resultant intensified vibration and noise. The first speed is sufficient and its use greatly reduces heat, vibration and noise, and the possibility of injury to a fear-stricken, mobile child. It is wise to keep well fixed in mind, particularly in operating on children, that most of the pain of a dental operation is due to friction from an old dull bur, which, because of its ineffectiveness, is merely polishing the exposed surface rather than cutting. In approaching a sensitive area, a new bur should be used.

In initiating young folks in dental care, especially very young patients, some small task should be undertaken at the first appointment. A prophylactic treatment makes a very auspicious beginning and is the quite generally accepted rule. However, I begin with the preparation and filling of a small cavity or seal a medicament in a large cavity, whether it is troublesome or not. I do this to acquaint the child with the operative procedures at the first visit: the noise and vibration of the bur, the slight discomfort of cotton rolls, the insertion of a medicament or filling, etc., so there will be nothing new at the second visit. I leave the prophylactic treatment to the last so that all fillings will be finished and polished and the mouth be cared for completely without the additional and usually non-compensatory appointment incident to polishing the fillings.

It is advisable to select and fill the small apparently painless cavity first, thus building up at least some tolerance to noise and pain before approaching the difficult ones.

A look of prosperity and good grooming serve one well in dealing with adolescents. These are the impressionable years in children, in which their respect may be gained or lost through very minor things; and respect and admiration are intangibles akin to assurance so far as the patient's tractability is concerned.

A day-old stubble, greasy spectacles, a threadbare necktie, a frayed cuff, baggy trousers or a soiled and wrinkled gown lead to uncomplimentary deductions in the patient's appraisal of our ability and respectability. Who am I to make such assertions? I was an adolescent once, and I was an adolescent when I first encountered a dentist, and to this day I can still narrate to you, in quite exacting detail, the impressions the operator made on me and what effect they had on my cooperation and forbearance.

THE CHILD

Naturally, the adolescent himself is our concern in this struggle of wits and endeavor. What sort of person is he? Arrogant, indifferent, cooperative or just plain "scared to death"? Has he physical defects which, by their mere presence since birth, have developed in him an inferior feeling? Has he mental shortcomings which preclude cooperation? Is he oversize, with an abundance of adipose tissue and the nervous system out of balance? Is he stoical when punished? Is he overapprehensive? Is he discourteous?

Peculiar as it may seem, the adolescent

who irritates and riles me more than any other is the precociously overbearing child. If I am to serve this type of boy or girl, I must have a complete understanding at the first appointment. I have to say pointedly, whether the parent likes it or not: "People can't talk that way in my office. It *is* my office and I make all the rules, and give all the orders. You may have told Dr. Blank what to do and how to do it, but here I'll give the orders."

On occasion, after a brief attempt to reason with an arrogant adolescent, I have suddenly, and without warning or promise, removed the towel, lifted the boy bodily from the chair and directed him hurriedly from the room, saying, "I'm too busy to be bothered with a boy like you. Run along home and don't return until you think you can act like a gentleman." One boy, surprised at his sudden change in status, and the state of affairs, cried as he and his mother departed.

One thing is certain regarding this type of patient: if he returns, he is all that you could wish of him; and if he doesn't, there is no great loss to the operator. I am convinced that reprimand in the office or punishment in the home should be sudden and dramatic. Indecisive orders and monotone promises have no place with young children or adolescents in either the office or the home.

In keeping abreast or just ahead of the child, maintaining all relations on an adult level is to be recommended. Educators call adolescents entering junior high or high school "Mr." and "Miss," to place them on an adult level. Parents can make children feel adult by eulogy or comparison, and here too the result is obvious.

A relationship based on an adult level gives an opportunity for a great deal of educational work with the child; not so much of the didactic "Brush your teeth twice a day" type, but concerning the cause and effect of conditions, the story of growth and eruption, the effect of failure of fusion, the result of food accumulation and many others, as well as generally accepted theories regarding diet.

To get along amicably, one must be honest. Of very young patients, who cry only because they feel bad, I frequently ask, "Do you want me to make it hurt?", to which the answer is always an emphatic "No." "All right," I reply, "let's stop crying. I can't be bothered with children who cry just because they feel like crying." The reaction is amazing.

To employ this method, one must know enough about the child and must know just where the bur is to be assured that it is not hurting. On the other hand, for the dentist to say that it doesn't hurt when it does makes a child angry and rebellious.

Encouragement should be given the child in trouble. I remark repeatedly, "I know it hurts, and you're doing fine, but one or two more times, and we'll be through." The child should be permitted to cry out in reaction to pain. Crying out in response to pain is a perfectly normal reaction; yet it is most amazing how much the volume of crying may be reduced by saying, "I know it hurts, and I don't blame you for crying, but please cry softly.'

Extend sympathy, yes, but extend it by action, and in a few well-chosen expressions, rather than in unadulterated form. The voice inflection that the mother employs in her extension of sympathy as she says, with her face distorted with pain, "Mother knows it hurts," brings nothing but a flood of tears.

Flattery is an excellent device. Young children will take it in large doses and like it. A friend of mine stops momentarily in his operating to say to a 4-year-old, "You know, John, I *like* you," and immediately continues with his operating, letting the child digest and assimilate the remark as he chooses. It works. I advise you to try it.

On the other hand, if flattery is used with adolescents, it must be spread very thin so that the child won't recognize it as such. It won't work in large doses.

Of all the tools of management, shame is of the least value. Shame must not be employed with the adolescent boy or girl, much less with a younger child. Such comments as "You can't take it"; "You ought to be ashamed," or "Bill Smith was in here yesterday and he didn't cry, and he's younger than you are," do no good. On the contrary, they do a great deal of harm. All the desire of the patient to assist is immediately forfeited and taking its place is a rebellious attitude, perhaps the most difficult of all as far as future adjustment is concerned. The patient may be in a receptive mood in an hour or so, or tomorrow, but at the time he is not approachable on a friendly basis.

Floyde Eddy Hogeboom has said, "After the dentist has once learned to manage himself and to be patient and resourceful, the management of children will become interesting and refreshing."

REMOVAL OF COMPLEX COMPOSITE ODONTOMA

By J. D. CRECCA,* D.D.S.; E. H. GUTHRIE,* D.D.S., and S. N. GREENSPAN,† D.D.S., Newark, N. J.

History.—A woman, aged 22, came to the dental clinic of the Newark City Hospital, April 8, 1939, with the complaint of an intense throbbing and at times shooting pain throughout the right side of the mandible, upward and around the right ear and over the right side of the head. This condition had been present for four days and four nights.

Examination.—A slight trismus was noted, with tenderness at the crest of the edentulous alveolus distally from the lower right second bicuspid. The lingual plate was high and bulging, with indentations or dimpling over the buccal plate. Lateral jaw films revealed a highly calcified irregular mass extending through the edentulous area and up under the ramus. Beneath this mass and extending into the mandibular canal were the crown and vestigial roots of an unerupted molar. (Fig. 1.) Between the time of examination and time of operation, attempts were made to relieve the pain by administration of nembutal and of codeine sulfate in the usual dosages, with no effect. It was found that morphine sulfate, one-quarter grain, every four hours, was necessary to control the pain, which was so intense that the patient threatened suicide.

Operation.—Four cubic centimeters of procaine hydrochloride was injected at the mandibular and mental foramina and in the long buccal nerve on the right side. Incisions in the long axis of the crest of the alveolus and buccally from the first bicuspid down to the buccal fold were made; the large mucoperiosteal flap was reflected buccally and lingually, and a large overlying plate of cortical bone was removed.

The impactor was used with chisel points to reduce any shocking blows, with the possibility of mandibular fracture in mind. With removal of the overlying bone, it was seen that it would be necessary to extract the second bicuspid. The lingual plate was left untouched, but enough of the buccal plate was removed to allow an elevator point on the impactor to wedge the mass upward and outward without any loss of substance of the ramus. The surface of the mass was pitted and highly irregular, but glossy as though

*Attending dental surgeon, Newark City Hospital.

†Dental intern, Newark City Hospital.

Fig. 1.—Lateral extra-oral roentgenogram showing size and position of tumor and proximity to second bicuspid and distal border of ramus. The crown of the unerupted molar lies beneath the mass, very close to the lower border of the mandible.

Fig. 2.—Postoperative photograph of mass and tooth (actual size).

formed of enamel. It measured almost 35 mm. in length, 25 mm. across and about 20 mm. in depth, and it was rocklike in shape, density and weight. (Fig. 2.) In a crypt below the large cavity formed by the removal of the mass was seen the crown of the unerupted molar extending into the mandibular canal. By careful removal of the surrounding bone and by elevation, the crown and its undeveloped roots were removed by splitting, and there below the crypt and extending into it was seen the unmistakable sheen of the mandibular nerve. Twenty-four inches of vaselin-iodoform gauze was lightly packed into the cavity and two black silk sutures were placed. In twenty-four hours, the patient was comfortable without sedation. Cold wet applications of magnesium sulfate were used to control the swelling. Every third day, the packing was removed, the cavity irrigated with chloramine-T solution and a slightly smaller packing placed.

Histologic Report.—The mass was composed of enamel, dentin and cementum, with enamel predominating.

Results.—One week after operation, the patient was able to chew without any discomfort. There was no recurrence of the pain and the trismus was greatly relieved.

111 Park Avenue.

WAX PATTERNS FOR GOLD INLAYS

By Eugene Bodmer,* D.D.S., M.S.D., Chicago, Ill.

THERE is no single step in the process of making a gold inlay that does not require the utmost care and precision. Each step must be considered a link in a continuous chain, the success of which depends on the success or strength of each individual link. Although this paper will deal entirely with wax patterns, full cognizance is given to the importance of the other steps in the process of making a cast gold inlay.

There are three principal methods of making wax patterns; namely, the direct, semi-indirect, or impression, method, and the indirect. In this paper, consideration of the direct method will include all technics in which wax is directly adapted to the cavity and completely trimmed in the mouth. The semi-indirect method will include those technics in which the wax pattern is made on a casting investment model, developed from a copper band impression in inlay wax. Any technic in which the wax pattern is developed on a stone or metallic die will be considered as indirect.

The question most frequently asked in relation to the methods of preparing wax patterns is, Which of the three technics will give the most satisfactory results? The answer to this question may be simplified by two statements of fact. First of all, there is no technic that will compensate for poor cavity preparation. Secondly, the only model spared all inaccuracies due to the physical changes of the materials used and the errors of the operator himself is the tooth with the properly prepared cavity. As the direct method is the only technic utilizing the tooth as the actual model for the wax pattern, it must be considered the method of choice. It is true that we are able to produce accurately fitting inlays by the other methods, but we must concede the fact that the chances of error in the other methods are multiplied owing to the greater number of steps involved in the procedures.

Occasionally, we are confronted by mouth conditions or certain types of cavities or restorations that make it impossible to obtain accurate, well-adapted and carved direct patterns. In such cases, the skilful employment of one or the other technic may be the best solution.

There are two types of one-surface restorations. These are the occlusal and the buccogingival or linguogingival third. In the case of the occlusal restoration, the difficulties most frequently encountered are (1) the adjustment of the inlay to occlusion and (2) removal of the inlay from the cavity without injury to the margins after the fit has been ascertained. Both of these difficulties may be avoided by using the direct technic in making the wax pattern. It is very simple to obtain correct occlusion in the wax pattern. Interference is much more easily eliminated in wax than in gold. By attaching the sprue wire in the center of the occlusal surface, we obtain an excellent means of removing the pattern from the cavity. After the casting has been made, the sprue serves as a handle and makes it possible to try in and remove the inlay

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*Assistant professor of operative dentistry, Northwestern University Dental School.

from the cavity without the slightest danger of injuring the margins. Just before cementation, the sprue may be cut off and the point of its attachment to the inlay reduced so that there will be no interference in occlusion.

Though we need not be concerned with the contact and occlusion in gingival inlay restorations, they are no less simple than other types because of the increased problem of their retention. In the preparation of these cavities, we must frequently use a minimum depth owing to the proximity of the pulp. Retention of the inlay must therefore depend on sharp angles and almost parallel walls in the prepared cavity, and, last but not least, a well-adapted wax pattern which takes full advantage of this retention. Inlays of this type made from patterns lacking accurate adaptation are doomed to certain failure.

As we need not be concerned with contact and occlusion, the most accurate technic for making wax patterns of this type is the semi-indirect, or impression, method. Once an accurate impression in wax is obtained and poured in casting investment, there is no chance of distortion during the subsequent process of developing the wax pattern. This is not true in the case of either the direct or the indirect technic. In both, distortion or loss of adaptation may occur during the process of carving, owing to the lack of inherent retention in the prepared cavity, and because the smallness of these cavities often prevents the operator from supporting the wax in case a displacing force must be applied in the process of carving. Inlays resulting from such patterns fit loosely into the cavity and depend almost entirely on cement for retention.

Two-surface cavities may be classified as to the direction of withdrawal of the wax pattern. Using this manner of classification, we find that there are two types, those prepared so that the pattern can be withdrawn in a labial or lingual direction, and those prepared to be withdrawn in an occlusal or incisal direction. There is little choice as to the wax pattern technic for the cavities in the first group. These patterns must be made by the direct technic as it is impossible to get enough of an impression of the tooth with the prepared cavity by the other methods.

The best technic for making wax patterns for two-surface cavities in which the direction of withdrawal is in an occlusal direction is the direct. In making a pattern by this technic, we have the surrounding structures to guide us in establishing the correct anatomic form, occlusion and proximal contour. The margins too can be carefully examined.

The only conditions which would contraindicate the use of the direct technic are (1) an overabundance or a thick, ropey condition of the saliva; (2) an over-active or large tongue; (3) absence of the proximal tooth, making the retention of the wax in the cavity difficult during the process of carving, and (4) very deep extension gingivally of the proximal portion of the cavity. In order to more successfully cope with these conditions, a technic should be employed which will cut down as much as possible the actual work in the mouth. Either the semi-indirect or indirect technic will serve the purpose.

A word of warning in relation to cavity preparation is appropriate at this time. A cavity prepared to meet the requirements of convenience form for a direct wax pattern will not necessarily meet the same requirements in case the pattern is to be made by one of the band impression methods. Should the tooth in question be quite bell-crowned, it will be noted that the proximal walls must be made more divergent, to escape the undercuts created by the curvature of these walls. The latter condition is not a factor when the direct technic is used, as all of the excess wax is removed from these curved margins before any attempt

is made to remove the wax impression from the cavity.

The indications for the various methods of making wax patterns for three-surface restorations are, quite naturally, similar to those for the two-surface inlay. Of all the different types of patterns that can be made by the direct method, the one which most operators avoid is the three-surface pattern, because they are not certain that good adaptation can be obtained and they feel that too much chair time is consumed. This attitude can be changed by adoption of and adherence to a good direct technic. The few minutes more of chair time that this technic may require will be recovered at the final appointment. Inlays made by the direct method require much less time for the adjustment of occlusion and contact.

The only contraindications for the direct method are as follows: (1) a new bite relation in the process of being established; (2) lack of proximal teeth; (3) unfavorable mouth conditions, such as a ropey condition or overabundance of the saliva, and overactivity of the tongue, and (4) inaccessibility, as in second and third molar cases. In all of these cases, one of the band impression technics is preferable. My choice is the indirect method.

A direct wax pattern technic should be selected which is simple and does not require elaborate equipment. It should be based upon sound physical principles. A technic which meets these requirements has been developed by R. H. Volland.

There are three important points to be considered in making a wax pattern by the direct method; namely, adapting, tempering and contouring the wax. The first step in making the pattern is the preparation of the wax, which must be so shaped that it will reach the most inaccessible portion of the cavity first, in order to assure that the wax will be properly adapted to that portion of the cavity. For the simple occlusal, proximoclusal, proximolingual or gingival third cavity preparations, the best form for the wax is that of a cone or wedge. In order to obtain this form, a sufficiently large piece of wax should be slowly warmed by rotation through the flame of a Bunsen burner. Care should be exercised not to melt or overheat the wax, to avoid loss of certain desirable and necessary properties.

For the mesioclusodistal, or mesiolinguodistal cavity, the best plan is to heat the wax in the previously described manner, and then mold it to the shape of a fan rather than that of a cone or wedge. By cutting a notch in the center of this wax, the form of a fork will be acquired, enabling the operator to better adapt the wax to the two gingival walls simultaneously. It is highly inadvisable to bend a straight piece of wax into a U shape with the intention of using this form in securing adaptation in a three-surface cavity, the reason being that too many strains are set up in the wax that cannot later be relieved.

The second consideration in the preparation of the wax should be met during the above-described process of manipulation. An attempt should be made to develop a hard inner cone of wax, covered by a warmer and softer outer layer. The reason for this procedure is twofold: 1. The hard inner cone will act as a plunger, carrying the softer wax on the surface into the fine lines of the cavity. 2. The wax comprising the inner cone will form the greatest bulk in the finished pattern. This wax, being just slightly warmed, will undergo less temperature change as it cools to mouth temperature and subsequently to room temperature. This treatment of the wax will insure a pattern whose adaptation to the walls of the cavity will not be lost by shrinkage of the wax, due to its cooling through a wider range of temperature.

When the wax has been properly prepared, it is forced into the cavity and driven to place with great pressure. The

patient should then be instructed to close in centric position and maintain the pressure sufficiently long to insure that the wax has congealed and is no longer flowing. This will eliminate much of the occlusal excess of wax and establish maximum cusp height. The wax should next be molded into the embrasures with the fingers, after which the patient is instructed to close again.

The wax, which by this time has cooled to mouth temperature, should be irrigated with water the temperature of which approximates 120° F. This rewarming of the wax results in dissipation of the molecular strain and also causes some degree of expansion, later followed by some contraction. However, only a slight amount of manipulation is necessary to correct the adaptation. The strains developed during this secondary adaptation are so small that their effect on the wax pattern is negligible.

The carving of the direct pattern is a simple procedure. First of all, the occlusal contour must be developed. This is done with a blunt right-angled burnisher the working face of which is 1.5 mm. in diameter. This instrument is carried along the inclined planes of the tooth structure, projecting the contour of the tooth into the wax. Refinements in the occlusal carving may be made with a beaver-tail burnisher or other suitable instrument.

In the case of lingual dovetail or mesiolinguodistal patterns, the lingual surface and embrasures should be completed first for the reason that the excess wax forced through and molded over the labial surface locks the wax firmly in the cavity and permits forces to be applied in a lingual direction, which would normally dislodge the pattern. After the lingual portion has been completed, the wax may be stabilized in the cavity, while the labial portion is being trimmed, by labial pressure on a ball of cotton held against the lingual surface of the pattern.

After the occlusal surface has been completed, the major excess of wax is removed from the buccal and lingual embrasures, being trimmed out roughly with a semisharp instrument such as the Ward wax carver No. 2. Care should be taken not to trim the wax to the enamel margin. Excess wax should never be cut from an enamel margin with a sharp or semisharp instrument. Wax is elastic and may be quite easily sprung out of the cavity as it feeds onto the blade of the cutting instrument. After the instrument has passed over the margin, the tension is released and the wax resumes its normal position in the cavity, slightly short of the margin.

When the major excess has been trimmed from the embrasures, the final contouring is done with a "shepherd hook" exploring tine, No. 23, which is used as a burnisher. Again the instrument is allowed to follow the contour of the remaining tooth structure, projecting that contour into the wax.

The wax pattern is now complete with the exception of a slight excess that may remain gingivally to the contact point. This is removed by means of number A sewing silk, used as one would pass a ligature between the teeth. The first cut made with the thread is gingivally and toward the proximal tooth. Just enough clearance is obtained to free the wax from contact with the adjoining tooth. In making the second cut, the silk thread is carried occlusogingivally to a point gingivally from the desired contact point of the wax pattern with the proximal tooth. Pressure is then brought against the wax in the gingival direction. The silk thread will act as a lancet, cutting away any gingival excess.

The final step in the preparation of the wax pattern is the polishing of the proximal surface, which is done with a plain linen or silk strip. In polishing the proximal surface, care must be taken that the strip tends to burnish the wax toward the margin of the cavity. In other words, in polishing and burnishing toward the

lingual margin, the strip should be held away from the buccal margin, and vice versa. The occlusal portion of the pattern may be polished with dry cotton tightly wrapped about the beaks of cotton pliers.

During the foregoing procedure, the chips and excess wax are washed away with water from a glass, the temperature of the water being originally 120° F. The frequent bathing of the pattern with this warm water has a tendency to relieve all deep and superficial strains that may have developed in the wax during its manipulation. The water gradually loses its heat until, by the end of the process, it probably reaches room temperature. This room-temperature water has a tendency to reduce the mouth temperature somewhat, so that when the pattern is removed, the change in degrees of temperature is slight. The resulting pattern will be one in which all strains of any consequence have been dissipated.

The pattern may be removed from the cavity either with an exploring tine or by attaching the sprue wire in the center of the occlusal surface. It is inadvisable to attach the sprue wire in the mouth if access is difficult or if the occlusal portion of the pattern is relatively small.

311 East Chicago Avenue.

SILVER NITRATE AND ZINC OXIDE IN THE TREATMENT OF CHILDREN'S TEETH

By F. W. GRAHAM, JR., Morris, Ill.

AS far back as one hundred years ago and prior to the discovery of arsenical paste for the devitalization of teeth, silver nitrate was used for that purpose. As early as 1846, the value of silver nitrate as an aid in controlling dental caries was recognized. In 1917, Percy R. Howe, present director of the Forsyth Dental Infirmary, of Boston, introduced a new solution of silver nitrate, a saturated aqueous solution to which was added strong ammonia water (37 per cent). As a reducing agent, he recommended a 25 per cent solution of formalin. Since 1917, this solution of silver nitrate has become popularly known as "Howe's Solution." Directions for making the solution can be obtained from an article entitled "Ammoniacal Silver Nitrate."[1]

The one fact concerning the use of this solution to which I wish to call your attention is that it is an alkaline solution, differing in this from the ordinary silver nitrate solution. Silver nitrate, in its ordinary state, is an acid salt. When dissolved in water, it contains a certain amount of free nitric acid, which is itself an irritant of considerable degree. By alkalizing this solution with ammonium hydroxide, we produce a delicately balanced solution having practically no irritating action. The chief advantage to be obtained from the use of Howe's Solution is its ability to sterilize disintegrated dentinal structure and to neutralize the acid reaction of dental caries. Sterilization results from the action of the metallic silver upon the proteins of the bacteria in the decayed

Read before the Section on Children's Dentistry at the Seventy-Sixth Annual Midwinter Meeting of the Chicago Dental Society, February 13, 1940.

tooth structure, which are precipitated and thus prevented from further action. Neutralization of the acid reaction of dental caries is accomplished by the alkaline reaction of Howe's Solution, which, if prepared properly and fresh, is slightly alkaline, having a pH of 8.5 to 9.5.

In my practice, I have found the use of Howe's Solution to be of great advantage in handling deep-seated caries in deciduous teeth, as well as in first permanent molars, particularly in the 11-15 year group, where we find the worst cases of advanced decay. The technic of application is very simple and is the same in deciduous and permanent teeth.

Let us take for example a large, deep cavity in a lower first permanent molar in a patient 12 years of age. As yet, the patient has had no ache in this particular tooth and, on the use of excavators and large round burs for the removal of the carious material, we find that we are rapidly approaching the pulp. If continued removal of decay would expose the pulp, it is advisable to take a roentgenogram of the tooth to determine the condition of the peridental membrane at the apex of the roots and also the proximity of the caries to the pulp. If the roentgenogram shows no involvement of the root end, I immediately assume that in this particular case the following treatment is indicated. The area is blocked off with cotton rolls and the cavity dried completely with pellets of absorbent cotton and warm air.

When the cavity has been completely dried, Howe's Solution is introduced into it by means of a pellet of cotton or a platinum loop, and the entire base and side walls of the cavity are saturated. The solution is allowed to penetrate for from one to two minutes and then the excess solution is removed with a dry cotton pellet. Immediately, a cotton pellet saturated with eugenol (U.S.P.) is applied to the cavity, and in from thirty of fifty seconds a dark stain will begin to appear at various points in the cavity. The eugenol is used as a reducing agent for the ammoniacal silver nitrate solution and the reducing action is permitted to continue from one to one and one-half minutes.

Walter T. McFall prefers eugenol to formalin solution for the reducing action because "we are not seeking to embalm the pulp, but rather to protect it."

Upon again drying the cavity, we find certain spots where there is intense black stain and other spots where there seems to have been no reaction. This is explained by the fact that we have intentionally left some carious tooth structure, which has no mineral content, in the base of the cavity. The silver nitrate solution has penetrated this particular material to its base, and when the reducing action of eugenol is introduced, we have literally filled all the dentinal tubules in the carious tooth structure with myriads of microscopic silver fillings. Where there is no dark stain, no penetration has resulted; which proves that Howe's Solution is self-limiting in its penetrating action. This self-limiting penetrative power is best explained by the fact that in normal, healthy, sound dentin, each tubule contains a tiny fibril which is a protein. Inasmuch as proteins are precipitated by the salts of heavy metals, we find that penetration of the silver nitrate solution to the depth where a vital fibril is encountered has produced a silver proteinate. This explanation has been offered by Prime[2] and by Ireland.[3]

After treatment in the foregoing manner, I have usually found it advisable to seal the cavity with either temporary stopping or cement for two or three days to allow the reduction of the silver nitrate solution to become complete.

At the next visit, a large round bur is used to remove the upper and more superficial portions of black stained tooth structure in the base of the cavity. Con-

tact with the bur will show that the previously carious material has assumed a hardness and resistance to cutting entirely different from that found at the previous sitting. If penetration and reduction have been properly carried out, the cavity will exhibit little or no sensitiveness to cutting by the bur. After the softer and looser portions of the stained area have been removed, the cavity is again blocked off with cotton rolls and thoroughly dried, and another application of silver nitrate solution is made and reduced with eugenol. As a rule, precipitation of the solution at this sitting will result in a more or less "mirror effect" in the area; which indicates complete and total saturation of the previously decayed tooth structure with metallic silver. When this point is reached, examination with an explorer will reveal that the area is now hard and firm and that the pulp is no longer sensitive to thermal changes such as result from the blast from an air syringe.

The technic just outlined is particularly applicable to deciduous teeth presenting large cavities in which any attempt to remove the decay almost invariably results in pulp exposure. The "mirror effect" is necessary for the best results from this treatment. As a rule, there will be little or no reaction to the application of Howe's Solution, because, as previously mentioned, the irritating quality of the silver nitrate solution is reduced to a minimum by the use of ammonium hydroxide in preparing the solution. The solution if properly prepared and fresh, should be slightly alkaline, with a pH of from 8.5 to 9.5. Any pain from the application of Howe's Solution is usually the result of thermal shock from the use of a solution of lower than body temperature.

Unlike most solutions and medicaments used in the dental office, Howe's Solution is relatively unstable after ten days, owing to the fact that each time the container is opened, a slight amount of ammonia is lost by evaporation, a change resulting in the pH from the acid reaction. Therefore, no more than one week's supply should be made up at a time. Ampules of the solution commercially prepared cost approximately 25 cents each, and an ampule, as a rule, is sufficient for an operating week of six days. I have made it a practice to open a new ampule every Monday morning and throw away the remainder from the previous week.

I grant that this method of treatment is in direct violation of Black's fundamental principle of operative dentistry, which states that *all* carious dentin should be removed from a cavity before a filling is inserted, but past experience has shown that the foregoing treatment is the exception that proves that rule.

Meticulous care should be exercised in using silver nitrate solution in the mouth because contact with the membranes will produce serious eschars. Should an eschar occur, a saturated solution of sodium chloride, or table salt, should be immediately applied to the injured parts, followed by application of oil of eucalyptus (not the eucalyptol compound).

Should some of Howe's Solution be accidently spilled on the hand or clothing, a stain can be prevented by immediate application of a saturated solution of potassium iodide.

Chemically pure zinc oxide combined with eugenol (U.S.P.) and spatulated to a very thick consistency to form a so-called "cement" has been used in the dental profession for many years. With this combination with Howe's silver nitrate solution, we have at our disposal two materials which are practically indispensable to modern dental practice.

With regard to the above-mentioned "cement," perhaps a better term than cement would be "liner" or "insulating agent." To properly mix this material, 3 drops of eugenol (U.S.P.) is placed on a glass mixing slab and on the other end

of the slab chemically pure zinc oxide powder is placed. The powder is gradually incorporated in the liquid with a metal spatula as one would mix oxyphosphate of zinc cement. Incorporation of the powder is continued until the mixture has the consistency of thick putty. The mass is then removed from the slab and placed between several thicknesses of gauze or in the corner of an ordinary dental hand towel, and, by thumb and forefinger pressure, the excess eugenol is expressed and is absorbed by the cloth. A slight kneading will bring more eugenol to the surface, which is again removed by pressure in the cloth. If placed upon the slab, the mass can be easily cut with the edge of the spatula. It will thus hold its form and have no tendency to flow. The mix just described is slow setting, as a rule requiring about forty-eight hours to completely harden in the mouth.

From the application of silver nitrate solution to the base of a deep seated cavity, reaching the point where the cavity walls were impregnated with silver nitrate solution, let us continue the treatment. With blunt-end plastic instruments, the zinc oxide and eugenol "cement" is placed in a carefully dried cavity and packed firmly against the cavity walls. I have found it practical to completely fill the cavity with this material, dismissing the patient with the admonition not to chew any hard substances in that region for at least twenty-four hours, since the material sets very slowly and, as a result, his cooperation is required for a successful result.

Several times, men in the profession have suggested that incorporation of powdered rosin in the mix will reduce the setting time, but I prefer to use just plain eugenol and zinc oxide since the one point to be desired is a lining over the pulp which is bland and absolutely non-irritating to the tooth structure. As I have not studied the chemistry of rosin in combination with zinc oxide and eugenol, I am in no position to predict the end-result. I have always tried to convey to my patients that I am sincerely interested in saving their teeth, but that I must have their cooperation. You will agree with me that any dental operation is more appreciated if the patient feels that he has had a part in the achievement of the desired result.

On the return of the patient after forty-eight hours, a cavity preparation is made in the zinc oxide "cement" to the desired depth for a normal cavity and a metallic filling is inserted. In practice, it will be found that this "cement" is readily adaptable as a base under either amalgam fillings or gold inlays. It has been suggested that, for use under an inlay, after the pattern has been made and cast, and the patient returns for the setting of the inlay, trimming out the material to about the depth of 0.5 mm. before setting the inlay will permit sealing the cavity with oxyphosphate of zinc cement between the inlay and the zinc oxide-eugenol base.

After using Howe's Solution in badly decayed deciduous molars of patients 7½ to 9 years of age, I have many times found it practical to use no other filling for sealing the cavity than zinc oxide and eugenol. This is done primarily because, as a rule, those teeth are on the verge of exfoliating to make room for the permanent teeth, and the patient's comfort is about the only factor to be considered in the retention of the teeth. At this age, jaw development has usually resulted in an increase in size of the dental arch, and contacts between the teeth simply do not exist. I grant that contact points and tooth contour cannot be satisfactorily restored with this material, but there are many times in a dental practice when the ideal treatment becomes impractical.

Zinc oxide and eugenol "cement" differs from an oxyphosphate of zinc cement, any of the copper cements and the modified silicate filling materials in that it is not brittle nor does it fracture so

readily if a sudden stress is placed upon it. Consequently, while the surface of the material may wear down through use, it is amazing how long one of these fillings will remain in place and keep the tooth sealed and the pulp protected. Howe and Prime have both stated that little or no intermediary is required because the pulp is covered with a nonconducting layer of metallized tissue. I am conservative enough, however, to believe that any strength added to the already weakened pulpal wall cannot possibly do harm, and may do good. Do not get the impression that it is my desire to have the patient make numerous unnecessary trips to the dental office. In the technic that I have described, each step has an important part and a high percentage of success will be attained.

In conclusion, I wish to quote again from Prime's article[2]:

Percy Howe's Solution was more than a contribution to dental literature; it was a stroke of genius. The profession has been slow in recognizing its value. If we may judge by our experience, it will mean the saving of millions of teeth which, without it, would be lost. It will mean health for thousands of people otherwise doomed to sickness.

I would not have you think that I believe this to be a 100 per cent effective treatment, or that it is a cure-all. I do believe that it can be successfully used in a majority of those cases which have heretofore been a question of concern to all of us. My experience with the technic dates back to August 1935, and since that time I have used it on an average of eight teeth a week. In those cases that I have been able to follow, it has failed three times. As the human equation enters into every operation performed in a dental office, I would caution you not to become too enthusiastic and expect this technic to work miracles where surely a miracle would be needed.

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110 East Jackson Street.

THE JOURNAL *of the*
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THE COUNCIL ON DENTAL EDUCATION

THE Dental Educational Council of America, the predecessor of the present body, was created in 1909, through cooperation of the National Dental Association, the National Association of Dental Examiners and the National Association of Dental Faculties, as an educational control agency, with the purpose of directing and determining the future educational plan of dentistry. This body functioned in its control capacity until 1923, when, under the impulse given to dental educational development by the Carnegie Foundation through its survey of dental education, the Council, by the authority of the three sponsoring bodies, assumed a more directive and determining position regarding the development and prosecution of dental education.

The Dental Educational Council of America, under the sponsorship of the Carnegie Foundation, directed the development of dental education to its credit and greatly to the advantage of dentistry up to the time when it was deemed desirable and advisable that this directive control be invested entirely in the hands of the organized profession, and largely because the financing of the project had become too burdensome for other sponsorship than the national organized body. Hence it was that

in 1937 a resolution was adopted by the House of Delegates providing for a Council on Dental Education to be created in which the three educational agencies, the National Association of Dental Examiners, the American Association of Dental Schools and the American Dental Association, were to participate, with the last body financing the new Council. It was also provided that an executive secretary be employed by the Council. In 1938, the new council was provided for in the Constitution and By-Laws and began activities, with Arthur H. Wherry as chairman. In 1939, Leroy M. S. Miner succeeded Dr. Wherry as chairman, and the Council, in 1940, selected as its secretary Harlan H. Horner, formerly Associate Commissioner of Education of New York State in charge of professional education.

Dr. Horner, though he is not a dentist, or should we say because of that fact, brings to the deliberations of the Council a seasoned experience of years of association with professional education that should serve to aid in incorporating in the university plan the educational program of a unit of humanitarian health service that was at one time designated by the president of one of the leading universities as the pariah of the university educational system.

The new Council, coincidently with the selection of a secretary, proceeded to assume its duties with appropriate sincerity and seriousness and, imbued with a new conception of its duties and responsibilities to the dental profession, has formulated and adopted as its first official act a set of requirements for the approval of a dental school. The plan is published in full on page 151 of the present issue of THE JOURNAL.

In the culmination of the events outlined above, we have another illustration of the broad conception and interpretation of the obligation of organized dentistry in assuming control of and undertaking to direct and control the educational trend and development of dental education.

The purposes and aims of the Council, as the Council itself conceives them, are:

> (1) To correlate, in accord with the evolution of scientific knowledge, clinical experience and social and economic conditions, the procedures of dental education with the problems involved in meeting oral health needs, and to interpret the relations of dental education to the dental profession and to the public.
>
> (2) To organize and administer criteria for accreditation of institutions for the study of dentistry in the United States.
>
> (3) To list recurrently for publication the acceptable agencies of

dental education in a manner to give the dental profession and the public authoritative information.

(4) To facilitate effective coordination of the efforts of dental schools, dental state boards and dental societies toward maintenance of adequate standards of professional proficiency.

(5) To foster constant improvement in the methods of teaching in dental schools, and to encourage the establishment of conditions that will attract an increasing number of men of outstanding ability in the career of dental teaching.

Although not specifically stated in its program of duties and objectives, the Council has clearly intimated that its conception of the future development of dentistry demands university association of all schools coming within its purview. And we take it from its declaration of purposes that the Council will direct at least a part of its energies toward developing a more wholesome attitude on the part of the universities toward dental education.

Our past and more recent experience has definitely demonstrated the desirability of inclusion of dental education in the university plan and under university discipline, and the new Council is thoroughly conscious of the social, educational and cultural advantages to be gained by such association. We are hopeful also that the Council can make the study of dentistry so attractive to prospective matriculants that the number of dentists will be greatly increased in the near future.

In times past, particularly in the period in which oral hygiene apparently promised to solve the dental health problem, we have been inclined to confuse dental needs and demands. The effort to meet what we believed to be demands, led to an appreciable increase in the output of the schools, and although we have apparently increased the man power of dentistry sufficiently to care for the actual demands on the part of the public, the actual dental needs have far exceeded our ability to render adequate dental service to the masses.

The dental profession today is not sufficiently large in numbers to meet the actual necessities of mouth care in our civilian public if we remove from general practice the number necessary for dental care of a mobile army such as actual war would demand; and just such an eventuality now threatens the country.

Although the present threatening emergency presages a shortage of dentists to care for the civilian population, we would not for a moment suggest the lowering of standards even though the present high standard is largely responsible for a falling off in the number of matriculants each year for the past several years. The Council on Dental Education

proposes to undertake the task of maintaining the present standards but, at the same time, to make dentistry so attractive to the output of the liberal arts colleges that it will attract to dental practice an increasing number of men of outstanding ability.

We have in times past felt that the educational standards of dentistry were being advanced so rapidly that it was difficult for the profession and the public to adapt themselves to the new standards, and it is our hope that the Council on Dental Education may prove to be a salutary and stabilizing influence toward such adaptation.

In the meantime and as a supplementary effort to that of the Council, it would be well for the profession at large to continue its efforts toward education of the public and the medical profession to the effect that dentistry and dental service are of sufficient importance to the health and welfare of the community to warrant and encourage its future development as an autonomous health service of recognized benefit to humanity.

THE GREATER NEW YORK DENTAL MEETING 1940

THE Greater New York Dental Meeting just held in New York City at the Pennsylvania Hotel was what may rightly be termed the second largest dental meeting ever held in this country. Although the registration figures, 13,841, fell somewhat short of those for the 1939 meeting, some features of the meeting elicited more enthusiastic attention than common from those present.

The registration figures for this and last year's meetings are quite remarkable as an indication of the interest in dental society efforts toward a comparatively new form of postgraduate dental education. There were actually registered at the recent meeting 7,594 dentists and 349 dental students, just a few short of 8,000 dentists, and an indication of the unusual interest manifested in the New York meeting.

The plan of the meeting was similar to that of last year, but the increasing interest and enthusiasm manifested in the Limited Attendance Clinics during the past three years impelled the management to enlarge that feature of the meeting this year, with the result that the registration for these clinics was something like 1,600 more than last year.

These clinics, a special feature of the annual meeting, emphasize the

educational *motif* of the meeting in an admirable manner. The Greater New York Meeting was one of the first to inaugurate the Limited Attendance Clinic and the success of the project is conspicuously evident.

The particular feature of large meetings that has always done much to increase their popularity is the social contact with old acquaintances, but the educational *motif* has now supplanted the social. It seems paradoxical that these fee educational clinics were inaugurated and developed during the depression period—an indication of the desire of the dentist to build for the future. This interest in the educational idea and other trends in dentistry encourage us to believe that dentistry will develop more and more toward the biologic and medical aspects of health service.

Associated with the Greater New York Meeting is a medical-dental meeting which has for its purpose the development of closer relations between the dental and medical professions and the development of the biologic aspect of dentistry. That one day of the program was devoted to consideration of the interrelated phases gives emphasis to the desire of both groups to cultivate more assiduously this mutually helpful relationship.

Another feature which the Greater New York Meeting has enlarged is the topic discussions held every morning of the meeting. Under the able direction of chosen specialists, these discussions bring much enlightenment to those eager to study the serious every-day problems of dental practice.

The manufacturers' exhibit was still larger this year, taxing to the utmost the housing capacity of the hotel for this type of exhibit.

The officers of the Greater New York Dental Meeting, Percy T. Phillips, chairman; Charles M. McNeely, advisory chairman; Charles A. Wilkie, vice-chairman and Harold S. Horton, secretary-treasurer, deserve the thanks of all who were privileged to attend this annual affair, which contributes so materially to the educational effort of dentistry.

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Proceedings of the Dental Centenary Celebration

GEORGE M. ANDERSON, Editor. Sponsored by the Maryland State Dental Association and the American Dental Association. Cloth. 1,048 pages; illustrated; 1940. Price $5.00.

THE Proceedings of the Dental Centenary Celebration comprise the published reports of the scientific sessions at the Dental Centenary Celebration held in Baltimore in March 1940. The contents of the book are in the form of a series of lectures presented by prominent members of the dental and medical and related professions on certain pertinent topics. It is interesting to note that the great majority of the material presented is concerned with the application of the biologic sciences to dental practice. The fact that few technical papers on dentistry are included in the volume may perhaps be regarded as indicative of what the next one hundred years in dentistry will produce. There are articles of outstanding interest, however, on almost all phases of dentistry. Particularly good are the sections on the historical development of certain aspects of dental practice. J. Ben Robinson contributes an interesting chapter on the history of dentistry from its initiation to the present time. The book is nicely bound, printed on good paper with excellent type, and well illustrated. The Proceedings of the Dental Centenary are of great interest from the standpoint of the history of dentistry and the trend of the development of dentistry and as a forecast of the future character of dental practice.

The 1940 Year Book of Dentistry

Edited by CHARLES G. DARLINGTON, M.D., GEORGE W. WILSON, D.D.S., HOWARD C. MILLER, D.D.S., WALTER H. WRIGHT, D.D.S., Ph.D., and GEORGE R. MOORE, D.D.S., M.S. Cloth. 824 pages plus index, with 569 illustrations. Price $3. The Year Book Publishers, Chicago, 1940.

ALTHOUGH this is the fortieth anniversary of the Year Book Series, it is but the fifth volume of the Year Book of Dentistry. In this issue, the editors and publisher have not only continued on the high plane of excellence set by previous volumes, but have even exceeded it. A new feature of the Year Book for this year is a special article by each editor in his own section on some pertinent phase of dental practice. Thus, Dr. Darlington discusses the "Present Status of Dental Foci of Infection"; Howard C. Miller contributes a timely and well-written article on "Complete Diagnosis in Oral Surgery," and other editors follow with similar worth-while subjects. The content of the book has, as in previous issues, been kept as practical as possible. There is much in this volume to interest the practicing dentist, the prosthodontist, the oral surgeon or the academician interested in the trends of dental literature. The volume is printed on good paper with clear, legible type, fully illustrated and attractively bound. It represents one of the best "buys" in professional books today.

BOOKS RECEIVED

The Foundations of Professional Dentistry (Monograph)

By J. BEN ROBINSON, D.D.S., Dean and Professor of Dental History, The Baltimore College of Dental Surgery; Chairman, Committee on History of the Dental Centenary Celebration; Member, Committee on History of the American College of Dentists; Member, Maryland Historical Society. Copyright, 1940. With the permission of the Dental Centenary Committee of the Maryland State Dental Association. Composed and printed at the Waverly Press, Inc., Baltimore, Md.

American Association for the Advancement of Science

A BRIEF HISTORY OF THE ASSOCIATION FROM ITS FOUNDING IN 1848 TO 1940; ITS PRESENT ORGANIZATION AND OPERATION; SUMMARIZED PROCEEDINGS FOR THE PERIOD FROM JANUARY 1934 TO JANUARY 1940, and A DIRECTORY OF MEMBERS AS OF JULY 1, 1940.

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President's Page

Fellow Members of the American Dental Association:

AS we continue to observe the harrowing conditions threatening life and liberty in Europe, we of these United States grow more thankful for our privilege of being Americans. We, today, alone of all nations continue to enjoy the right to think and act as independent individuals. With a surety of freedom and security, we continue to face problems set clearly and truthfully before us, and to strive without fetters of dictatorship for our individual and common good. We, as dentists, appreciate the effects of this democratic governmental functioning in its close relationship to our lives when we pause to consider the results obtained by the American Dental Association. Working with the loyalty and skill of a united membership, ceaselessly aiming toward the betterment of both dentistry and the dentist that the public may benefit accordingly, our organization is an admirable outgrowth of "The American Way."

To afford a clearer concept of the achievements of the American Dental Association and to show how each dentist reaps untold benefit from his membership, we take pleasure in presenting the following outline of the activities of some of our committees.

THE DENTAL PREPAREDNESS COMMITTEE

The Dental Preparedness Committee appointed a year ago by our immediate Past President, Dr. Merritt, has secured the appointment of a military affairs committee in each state. It is now working for the organizing of subcommittees, the purpose of which will be to increase the effectiveness of the preparedness program. The Dental Preparedness Committee acknowledges excellent cooperation from the state military committees as well as from the officers of the state and component societies, deans of schools and the state boards of dental examiners. Further details of this committee's activities will be found elsewhere in THE JOURNAL.

THE MEMBERSHIP COMMITTEE

Preparing for a membership canvass to take place shortly after the first of this month (January 1941), the Membership Committee is working tirelessly for a 55,000 membership. To be successful in this drive, it will be necessary for each member of the American

Dental Association to do his utmost to obtain at least one new member.

THE BUREAU OF PUBLIC RELATIONS

The Bureau of Public Relations is one of the principal departments through which the American Dental Association maintains cooperative affiliations with other organizations. The Bureau of Public Relations, in conjunction with the Committee on Public Health and Education, prepares and distributes authoritative dental health material to state and component dental societies, to other health organizations and to individuals. Mediums of distribution are leaflets, posters, charts, exhibits, slides, movies, the radio and the press. Last year, the Bureau distributed more than three quarters of a million pieces of literature and reached an audience of millions of people through the press and the radio. This material is also available to all state and county societies.

THE LEGISLATIVE COMMITTEE

The Legislative Committee is constantly on the alert, analyzing all proposed national dental legislation, originating new dental laws of a national character and consulting and advising when requested to do so the various state dental associations. This committee also has on file legislative data which are available to any, or all, of the constituent organizations on request.

COUNCIL ON DENTAL EDUCATION

Prominent among activities of the Council on Dental Education are plans for a congress of dental education and licensure, to be held during the Midwinter Meeting of the Chicago Dental Society, Saturday, February 15. This congress will bring together for the first time dental teachers and dental examiners in a survey of common problems. Any member of the American Dental Association who desires to attend will be most welcome. The Council is also preparing for distribution in 1941 a comprehensive brochure on the dental profession, designed for the guidance of officers and prospective dental students. Other distinguished work of the Council, a statement of "Requirements for the Approval of a Dental School," is recorded in this issue of THE JOURNAL.

THE NATIONAL DENTAL HEALTH PROGRAM COMMITTEE

On introduction of the Wagner Health Bill before the Senate of the United States, the National Dental Health Program Committee was appointed as a special committee of the House of Delegates, at the St. Louis meeting in 1938. The National Dental Health Program Committee has appeared at hearings in Washington, D. C., to

represent the American Dental Association, in dental health matters. Because of the inadequacies of the Wagner Bill in connection with dental health, this committee has formulated tentative plans for the participation of organized dentistry in a national health program. These plans provide for increased dental research, further public dental health education and a program of dental care of the indigent with funds supplied by the Government. The committee is at present working on a pamphlet defining the rôles to be assumed by state and local dental societies in a program of dental health. This booklet will be available to our members in the very near future.

THE COUNCIL ON DENTAL THERAPEUTICS

The never-ending job of protecting the public and the profession against dental therapeutic frauds is one of the chief functions of the Council on Dental Therapeutics. In its annual publication "Accepted Dental Remedies," the Council has performed invaluable work by listing therapeutic products of established value.

THE DENTAL RELIEF COMMISSION

The worthy purposes of the Dental Relief Commission were referred to in the December pages of THE JOURNAL. The aid offered to unfortunate members of the dental profession and their relatives has been whole-heartedly endorsed by the entire American Dental Association. During the last fiscal year, eighty-three grants were made to seventy-two needy dentists or widows of members. Thirty state associations were beneficiaries of these grants. At the end of the last fiscal year, or during the month of June, fifty-four members or widows received checks, and since that time twenty-two applications have been accepted and approved by the Commission. These twenty-two applications represent distribution in thirteen states. Monthly benefits to each recipient average $40. The usual period of assistance is from six to twelve months.

THE COMMITTEE ON ECONOMICS

The Committee on Economics is composed of fourteen members, one from each of the Trustee districts and a representative of the U. S. Public Health Service. Each committee member establishes a group of deputies representing the states in his district, with the result that there are approximately fifty members identified with the economic interests of the Association. Work of this committee comprises all subjects of office management, health plans for community and industry, under state or federal auspices, fact finding and distribution of economic data. These data are available to all state and local societies on request to the Secretary of the American Dental Association in the Central Office in Chicago.

THE JUDICIAL COUNCIL

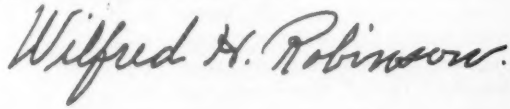
The chief functions of the highly important Judicial Council are to decide all questions of an ethical nature for the American Dental Association; adjust controversies relating to ethics and deportment between members of the Association or between members and their district dental societies or state dental associations, and to act as the third of four courts of appeal for a member expelled or suspended by the local dental society, the member first appealing the issue to his component society, then to his state association and subsequently to the Judicial Council.

THE RESEARCH COMMISSION

The Research Commission, a standing committee, consists of nineteen members. All problems in dental research brought before the American Dental Association passes under this committee's scrutiny. It promotes original dental research as well as correlating for American dentistry the findings in research of all other allied organizations in the dental health field. Quite recently, this committee gathered all available data to be had on dental decay from throughout the entire world and compiled it in book form. This volume, "Dental Caries," is at present available to the dentists of the United States from the Central office of the American Dental Association, 212 East Superior St., Chicago, Ill.

To learn more of the aims and activities of our Association, letters have been sent to the presidents, presidents elect, secretaries and editors of every constituent state society in the United States, calling for plans and ideas which might suggest a solution of their various problems and which should prove of value to the American Dental Association as well. The large number of responses so far received will be of assistance in establishing a program, which will be outlined and presented during the State Officers Conference in Chicago in February.

The Officers of the American Dental Association are hopeful that this forthcoming meeting will see a large representation from the state associations. The state officers in attendance will be more than repaid by the knowledge to be gained from the discussion of the state dental association problems presented and the solutions offered and by the spirit of enthusiasm and cooperation which marks all gatherings of the American Dental Association.



DENTAL PREPAREDNESS COMMITTEE

HAVE YOU RETURNED YOUR QUESTIONNAIRE?

If not, will you do so at once?

If you do not have a questionnaire, please write to the American Dental Association, 212 E. Superior St., Chicago, Ill., and one will be forwarded immediately.

You will want your name to appear in the dental directory.

DECEMBER 10, 1940, 42,000 questionnaires had been returned of an original mailing of approximately 73,000, a return of but 57 per cent, which obviously is not sufficient to warrant a compilation of statistics on the dental resources of the United States, and certainly not sufficient to warrant the publication of a dental directory.

Many misunderstandings have arisen since the questionnaire was mailed, probably the most serious of which is based on the mistaken idea that the age of the recipient may make return of the questionnaire unnecessary. It is the hope of the Dental Preparedness Committee that *all* dentists will make a return regardless of their age, since a complete return is of vital importance in the compilation of any facts regarding the profession.

Then too, many dentists did not receive a questionnaire in the original mailing, owing to the fact that a commercial mailing list was used, in order to include those dentists who are not members of the American Dental Association. If you, as a member of the American Dental Association, did not receive a questionnaire, please send a postal card to the American Dental Association, 212 East Superior St., Chicago, Ill., giving your name and complete address, and a questionnaire will be sent to you immediately.

The returns from the various states show a varying response to this movement. December 10, 1940, the returns from thirty-nine states had been checked against the original mailing list. Examine the figures and improve the standing of your own state by returning your questionnaire.

C. WILLARD CAMALIER, D.D.S.,
Chairman,
GERALD D. TIMMONS, D.D.S.,
212 East Superior St.,
Chicago, Ill.
Secretary,

PERCENTAGE OF QUESTIONNAIRE RETURNS BY STATES

State	Number Mailed	Per Cent Returned
Alabama	582	54
Alaska	32	25
Arizona	137	67
Arkansas	380	51
California	5,533	59
Colorado	671	44
Connecticut	1,101	57
Delaware	114	46
District of Columbia	644	43

State	Number Mailed	Per Cent Returned
Florida	704	51
Georgia	735	49
Hawaii	218	51
Idaho	242	46
Indiana	1,914	60
Iowa	1,681	62
Kansas	1,086	48
Kentucky	859	51
Louisiana	718	42
Maine	401	51
Maryland	821	49
Massachusetts	2,999	49
Michigan	2,895	57
Minnesota	2,187	71
Mississippi	470	49
Montana	286	68
Nebraska	970	59
Nevada	67	36
New Hampshire	242	54
New Mexico	109	57
North Carolina	913	47
North Dakota	269	66
Oklahoma	759	51
Oregon	875	52
South Dakota	309	61
Utah	326	53
Vermont	155	54
Virginia	898	50
Wisconsin	2,297	58
Wyoming	127	56

BUREAU OF PUBLIC RELATIONS

SCIENTIFIC AND HEALTH EXHIBIT AWARDS

THE scientific and health exhibits displayed at the Eighty-Second Meeting of the American Dental Association in Cleveland exceeded in scope and magnitude those of any previous meeting. The fact that 1940 marked the Centennial Anniversary of Dentistry inspired a number of schools and individuals to display historical exhibits of unusual character and interest. These, plus the exceptionally large number of scientific and health exhibits, taxed the capacity of Cleveland's new and modern municipal auditorium.

The hobby exhibits, an innovation this year, were displayed in the corridor encircling the arena.

Following the custom established last year, the Exhibit Section was open to the public each day from 9:00 a.m. to 5:30 p.m. and Tuesday evening until 10:00.

As can be judged from the accompanying illustrations, the quality of this year's exhibits was exceptionally high, establishing a mark for next year's exhibitors to shoot at.

The following exhibits won awards:

Historical Exhibits

First award: Maryland State Dental Association.

Second award: University of Pittsburgh Dental School.

Third award: Northwestern University Dental School.

Scientific Exhibits by Schools and Institutions

First award: Western Reserve University, Bolton Fund.

Second award: University of California, College of Dentistry.

Third award: University of Michigan, School of Dentistry, Ralph F. Sommer, D.D.S.

Honorable mention: Temple University School of Dentistry.

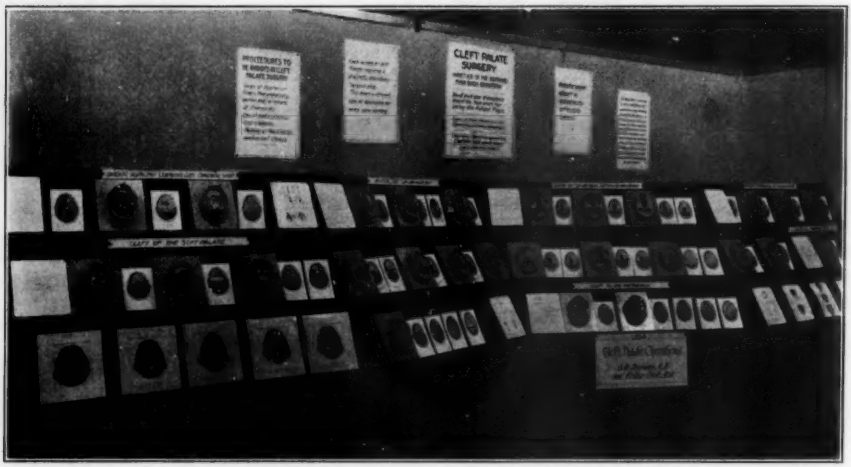


Fig. 1.—Cleft palate operations exhibit presented by G. M. Dorrance, M.D., and Arthur Dick, M.D., which won the second award in Division B (Individual Scientific Exhibits) at the American Dental Association meeting in Cleveland, September 9-13.

Fig. 2.—Historical development of anesthesia exhibit; early dental literature and moulages of pathologic cases. This exhibit, presented by the University of Pittsburgh School of Dentistry, won the second award in Division D (Historical Exhibits) at the Amercan Dental Association meeting in Cleveland, September 9-13.

Scientific Exhibits by Individuals

First award: D. B. Waugh, D.D.S.
Second award: G. M. Dorrance, M.D., and Arthur Dick, M.D.
Third award: K. E. Taylor, D.D.S.

ment of Public Health.
Honorable mention: Missouri State Health Department, Dental Division.

Hobby Exhibits

First award: Bernie Cooper, D.D.S.

Fig. 3.—Historical exhibit: first journal, first college, first society. This exhibit, presented by the Maryland State Dental Association, won first award in Division D (Historical Exhibits) at the American Dental Association meeting in Cleveland, September 9-13.

Health and Educational Exhibits

First award: Cleveland Child Health Association.
Second award: Walter E. Briggs, D.D.S.
Third award: Tennessee State Department of Public Health.
Honorable mention: Missouri State Health Department, Dental Division.

Hobby Exhibits

First award: Bernie Cooper, D.D.S.
Second award: Howard A. Hartman, D.D.S.
Third award: W. M. Goodwin, D.D.S.
Honorable mention: J. V. Gentilly, D.D.S.

THE DENTAL HEALTH EDUCATION OF CHILDREN

By Vern D. Irwin,* D.D.S., Minneapolis, Minn.

As this year of 1940 is the one hundredth anniversary of the opening of the first dental college in this country, it may be fitting to look backward in review a little and, at the same time, take an inventory of our present status, especially as it may be related to the subject of dental health education. Considerably more than half of the past century was spent in gaining recognition of dentistry as a profession. The last twenty-five years has seen the consolidation of those gains, and a perfection of mechanical technics that has made dentistry the greatest single contributor to positive rehabilitation. In all of the medical field, there is no branch that restores the parts to their original function so accurately and wholly.

It is evident to any one that the second hundred year period is starting from a new approach, something to which we as a profession have paid little attention, for we have been busy perfecting the mechanical phases of our work. This new attitude and approach will probably be known as the public health aspect of dentistry. Today, the country over, there is a rapidly developing consciousness of personal health as it relates to community health. In many places, diseases of the teeth and the mouth are receiving their first consideration as a public health problem. For that reason, the dental profession may hopefully look forward to a time when medical students and student nurses will receive adequate training in dental health.

The medical health officer of today probably has a better grasp of the public health aspects of dental health than a great many members of our own profession. He is interested in dental health because he knows that the curve on the nation's health chart is adversely affected by the health of the individual. He knows that dental disease contributes to general ill health. Public health work has, especially in the northern states, practically eliminated a great many of the communicable diseases. Health officers are looking for new fields to conquer while perfecting processes of control over the old ones. Dental health now receives serious consideration at the hands of state and local health officers, the United States Public Health Service, the Children's Bureau and a few endowed foundations. Dental research has received a new impetus, but as yet not much new money. It is encouraging to note that "research funds" is the number one item among the suggestions that the National Health Program Committee of the American Dental Association is prepared to make to the federal government.[1]

BUILDING A HEALTH CONCEPT

The practice of dentistry in the past has been too restricted in its health applications. We have avoided children's dentistry. We have to some extent been responsible for the attitude of the public

*Dental Health Director, Minnesota Department of Health.

Read before the Section on Children's Dentistry at the Seventy-Sixth Annual Midwinter Meeting of the Chicago Dental Society, February 14, 1940.

toward the care of children's teeth. A recent case of a dentist signing more than 100 dental examination cards for school children, indicating that he had completed all necessary dental work, without ever looking into the children's mouths, represents the practice of only a few who contribute to a poor public regard for dental health. Too many dental offices are merely filling stations. We need to educate dentists to practice their profession from a health point of view. It is no secret that public welfare agencies that make the decisions on health matters for the poor and hold the purse strings of the city, county or township have little regard for dentistry as a health profession. Who is responsible for their ideas and conclusions? I would suggest that the private practitioner and the leaders in his professional organizations are responsible for the situation. We have failed to build, through the years, a dental health consciousness in the people. We have talked too much about relieving toothache, extracting teeth, filling spaces and biting corn off the cob with dentures. Nearly every dental radio talk refers to toothache, toothbrushes and oral hygiene. It is time that we drop the words "oral hygiene," which means only toothbrush drills to most lay people, and adopt the more appropriate term "dental health."

The dental profession needs more training in psychology. It needs to know how the public reacts to its practices and its attitudes. The profession has not yet instilled into the public mind what it wants reflected in public attitudes. Men like George W. Crane,[2] of Northwestern University, are helping us see the need of selling dentistry as a health profession. We must resort to the psychologic appeal of expert advertising men. In voicing our message of health, we must be more specific. With a clear conscience, we can, for instance, enlarge upon the possibilities of restoring youth to faces after years of dental neglect through re-establishing the chin-nose dimension, and of protecting faces against loss of the normal and natural personal appearance by early care; the dental requirements for a pleasant breath; the economic aspects of early care; the opportunities of life-long benefit to children through orthodontia and good dental care; the value of good-looking teeth behind the smile in business and social life, and, if you please and dare to, an approach to the general idea behind such slogans as "Keep kissable."

Dental health, as such, has an appeal that is much too anemic. A stimulating motivator must be hooked on for a booster. All of this public health work has caught the profession unprepared. It will require intelligent direction of dental leaders everywhere to get those now in practice to adopt the health approach to the dental problems of their patients. Dental schools should emphasize more than ever the personal health and public health aspects of dentistry. In the beginning of this second century of dentistry, we find many signs that the profession will meet these new concepts. The response of dentists in a number of states to the offer of short courses in children's dentistry sponsored by state health departments has been most encouraging. Fifty-five per cent of Minnesota dentists who practice in rural communities took such a course during the past two years. Surely a lively interest in dentistry for children on the part of men now in practice is a sound and forceful argument against the two-level plan of dental practice. The two-level plan, one level for practicing what one of its advocates calls "simple extractions, simple fillings and prophylaxis for children," the other level relating to adult dentistry, meets with a cordial response in some quarters because of the knowledge that dentists neglect children's dentistry. In several cities of the country, it is plainly evident that our present system is working very well. In Min-

neapolis, for instance, a report shows that 74 per cent of school children have healthy mouths at the end of the school year. The dental work was not done by half-trained mechanics, technicians or hygienists, but by licensed dentists in their daily routine of practice with the assistance of four or five community fund clinics.

The dental health education of children depends to a great extent on the practicing dentist. Nowhere can dental attitudes and habits be built better and urged with more sincerity of purpose than in the daily contacts that dentists have with child patients and their parents. For nearly all children, the attitude of the parent is the determining factor in the child's dental care. Parents who are told that their child's teeth are important to his health, comfort, behavior, progress in school and future personal appearance are more apt to look seriously upon the child's so-called temporary teeth, as well as his permanent teeth. The dentist in his office, through the use of numerous visual education aids, can and should take enough time and energy to educate both child and parent in dental health problems. Pedodontists tell us that parents are enough interested in their children's teeth to make necessary sacrifices themselves to give their children proper dental care. There is accumulating evidence that dental work for children is profitable to the dentist. The statement on this subject made by George E. Morgan is most appropriate: "Children's dentistry pays if you do it and it doesn't pay if you don't do it."

NAMES AND CLAIMS

It would be of help to dentists who give educational talks to children and lay groups, if a decision could be made as to what to call the first set of teeth. When we call them in turn first teeth, temporary teeth, deciduous teeth, milk teeth, baby teeth and foundation teeth, we confuse the listener and the reader of our educational pamphlets. Psychologically, we cannot expect parents or children to regard these teeth with the proper degree of seriousness if we call teeth that remain in the mouth from six to eleven years temporary, or if we call them baby teeth for nine or ten years after the child is no longer a babe in arms. The term "deciduous," which is used most commonly in dental literature, is further evidence of futile groping for a proper term for "first teeth." "Milk teeth" is a term seldom used any more; and the term "foundation teeth," although having some desirable wishful thinking implied in it, would better apply if the process of growth, development and eruption were upside down. The American Society for the Promotion of Dentistry for Children should find a proper term for these teeth, which the American Dental Association could officially adopt.

The education of the preschool child must be carried on largely by the parents in creating proper attitudes and habits in themselves and in their children. This, then, encompasses the field of adult education for the parents. Education of prospective mothers and their physicians is important to the dental health of the preschool child. This requires first a common understanding among dentists as to what can be safely said to prospective mothers about the care of their own mouths and about the prenatal care which they should take for the benefit of the child. We all agree that the mother is safe in seeking care for her dental needs during early pregnancy and even late pregnancy in emergency cases. With the physician, we agree that a balanced diet prescribed by the physician is a good thing for the mother and the developing embryo. There is not much agreement among physicians and dentists just now regarding the use of therapeutic doses of calcium and phosphorus by the prospective mother. There is considerable

disagreement among dentists regarding the medicinal use of calcium and phosphorus at any time for developing teeth or for protecting them against decay after they are formed. We have urged the use of dicalcium phosphate wafers for years and now are told that assimilation of those substances in combination does not take place.

Every time we go astray in matters of diet, we lose prestige with the public. We have a constant urge to do wishful thinking and "jump the gun" on research. For years, we have been telling people that if they ate the right foods, dental caries could be prevented or controlled. Our advice has apparently aided in the growth and development of the child, but there are more cavities now than ever. It may be true that caries has been arrested in dentin by controlled technics, but we must not forget that caries starts in the enamel.

It seems unwise to make promises of prevention and control of incipient caries through diet in the light of our present knowledge. It would be better to say that certain foods should be eaten for growth, development and maintenance of optimum health with the hope that the rewards which come will include benefits to the teeth. However, most of us seem to agree that there is a possibility of building good teeth with good materials when the teeth are in the process of formation. The important attitude in teaching the public is to be a little less positive until we know more about diet and dental health, in order to protect the profession from boomerangs in the way of censure from the public and our own research men. The recent publication entitled "Dental Caries" shows how far apart our research workers are on the subject.

PREVENTIVE DENTISTRY

Our advice on preventive dentistry should emphasize early and frequent care of the teeth and gums. If the figures from the Guggenheim Clinic are accurate, 47 per cent of children 2 years of age have cavities.[3] For several years, I have urged that parents take their children to the dentist four times a year between the ages of 2 and 6, three times a year between 6 and 13 and twice a year thereafter. When cavities are discovered early and the teeth filled, the usual serious consequences will be avoided. If periodontal breakdown is discovered early enough, correction can be made, the teeth can be saved and the tissues surrounding them can be restored to a healthy condition. We should routinely advise prophylactic odontotomy and caution against the heavy intake of sugar.

Prevention through home care should be urged for the good it does for the exposed surfaces of the teeth. Advising people to clean between the teeth with a toothbrush is in a sense promising them something that cannot be done in most mouths. We need something more effective than the toothbrush. We should get back to the judicious use of dental floss or develop something better to clean the proximal surfaces of the teeth. The usual order of importance stressed in preventive dentistry even after teeth are once formed is (1) diet, (2) home care and (3) early and frequent care of the teeth in the dental office. To reverse this order would seem more practical and more in line with present knowledge of truly preventive measures. What we say to parents and children is most important in developing in them proper attitudes toward the profession and toward their own teeth. We should readily admit that the cause and prevention of dental caries are still unknown. Some encouraging research has brought hope regarding the prevention of caries, but what a mistake it would be to advocate, for instance, the fluorination of water supplies on the present evidence that fluorine apparently inhibits the formation of dental cavities! This has already been done in an article appearing in the

Journal of the American Water Works Association.[4] We can afford to wait in order to be sure. Experience with other things teaches us to be cautious.

Recently, I received for review a radio talk that a dentist had given. In it, he called attention to the use of ammoniacal silver nitrate as a preventive of incipient dental caries. Many of us may agree that ammoniacal silver nitrate will do what is claimed for it. That is not important at the moment. It is important, however, that we do not again excite the public by radio or public utterance about a therapeutic agent that has not yet received the general acceptance of the profession. The profession needs every protection against the publicizing of improved claims in this new era of building a proper public health concept of dentistry.

DELINQUENCIES OF DENTAL PRACTICE

If we are to teach children the right things, we must first determine what is right. Then we must be able to perform the service that we urge them to seek. The public is learning to demand better dental service. The universal and continuous use of the bitewing roentgenogram is being urged upon the public by public health dentists. Orthodontia is likewise suggested for the many cases of malocclusion and alinement defects. For the adult, the treatment of pyorrhea and of Vincent's infection is being urged. The public is warned about the dangers of abscessed teeth. But, for a moment, let us see what the profession does about these things. Bitewing films are not routinely and consistently used in a majority of dental offices. Only a small percentage of orthodontia cases are cared for in any community, usually because of lack of information on the part of the patient or lack of training on the part of some dentist in the community who might take such cases. Pyorrhea is seldom discovered until it is considerably advanced, and when it is discovered, many dentists still tell their patients that there is no cure for it, that nothing can be done about it. In one of the easy steps in treatment of pyorrhea, few dentists know how or take the time to remove all of the calculus from all of the teeth. Some dentists prefer to turn their periodontia cases over to a dental hygienist, who will give the teeth a prophylactic treatment, and may violate the law by scaling the teeth beneath the gums where the irritating calculus lies. In the treatment of Vincent's infection, many dentists fail to look for clinical evidence, still depending on the microscopic smear for a diagnosis. This results in either a misdiagnosis or overtreatment of a true case. We still temporize with abscessed teeth.

Dentistry has enough valid claims as a health profession without making undue claims as to its importance in the medical field. The late Charles H. Mayo once said that the mouth was the greatest portal of entrance of germ life into the body. Many dentists lost no time in twisting the meaning of his words to indicate that dental conditions were responsible for most of man's illness.

Not long ago in a class in epidemiology made up mostly of physicians studying public health, a lantern slide entitled "The Mouth Is the Gateway to Infection" was shown as an example of propagation of unsound ideas. From the mouth, lines led to the following named diseases: tuberculosis, diphtheria, scarlet fever, streptococcic sore throat, whooping-cough, mumps, pneumonia, influenza, Vincent's angina, common cold, tonsillitis, infantile paralysis, tapeworm and dysentery. The sentence in the upper right hand corner of the slide read "Good mouth hygiene greatly reduces the danger." On the bottom was the name of a good university and this sentence "A message more powerful than words." The implication was that the control of tuberculosis, diphtheria, scarlet fever, mumps, influenza, infantile paraly-

sis, tapeworm, dysentery, etc., depended to a great extent on mouth health. It is doubtful whether any epidemiologist would agree with that theory, except in the case of Vincent's infection. Of course, we all agree that lowered resistance may have an influence on the susceptibility in these cases, but that was not the implication of the slide.

DENTAL FACTS FOR EDUCATORS

The sole desire of those in our profession who are engaged in public health work is to transmit scientific facts on dental health to the public and to motivate people to adopt such habits and practices as will insure optimum dental health from childhood through old age.

The status of health teaching material, the country over, is such that most of it needs to be revised. General health and dental health material are now undergoing the scrutiny of respective national committees in the American Medical Association, the National Educational Association and the American Association of Public Health Dentists. We are told that the educator desires from us only the dental facts that we would like to have taught in the schools. From these facts, the educators will build the various kinds of teaching devices suitable to their needs. It is much better for the educators to build these teaching devices than for dentists to assume duties that are not in their field. To meet the situation, a committee from the American Association of Public Health dentists is now at work compiling the factual material. Before presenting this material to the educators, it is planned to have it authenticated by the American Dental Association, the United States Public Health Service and other groups who have a natural interest in the subject. The material will be arranged for the various grade levels. Another committee is now working on factual material for the dental health education of adults. By the time the material has run the gauntlet of these organizations, it is doubtful whether unsubstantiated claims and wishful thinking will remain. In entering this field as an organization, dentistry must put its best foot forward. If it does, a ready reception awaits its efforts in every school room in the land.

To assist teachers, nurses and others in teaching dental health, the American Association of Public Health Dentists is preparing a manual on short courses in dental health. It is hoped that these short courses will be used to train student teachers, student nurses and medical students, as well as those who are now engaged in the teaching and public health professions.

In discussing "The Teaching Aspects of a Dental Health Program,"[5] Anna M. Wiecking, Ph.D., has the following to say about factors and general principles in health teaching:

> Certain *psychologic* factors are present. There is still some antagonism toward the school on the part of the home because the former has taken over certain prerogatives of the latter. Often our suggestions for welfare encroach upon strongly established customs and ideas, and upon personal freedom. There is seen a negativism even in intelligent adults against eating healthful foods, probably a hangover from childhood. People react against campaigning that smacks of reforming or moralizing.
>
> *Economic and social factors* are at work. . . . Erroneous information is sometimes given out by advertising firms. With slogans they often teach wrong things more successfully than we teach right ones.
>
> *Pedagogic factors* are in the picture. We have an overcrowded, patched-on curriculum that covers far too much ground. We need a basic reorganization of the whole. Our instructional procedures are traditionally factual, memoriter, repetitive in character, and too isolated from real life issues. Our reorganizations of subject-matter tend to be a series of isolated lessons instead of larger units which call for intelligent pupil thinking. Teachers have not been much interested in health teaching, partly because they have had such poor materials to work with, and

partly because they have had too much to teach.

Rather a poor psychology of learning has been operating. People have thought it necessary to employ too much preaching or a sugar-coating technic in order to interest children in their health. A host of extraneous and artificial devices has resulted.

On the hopeful side there are several tendencies. There is a much wider interest in the work of the scientific world. Adults are finding that it is not only children who need to eat protective foods for optimum health. More authentic information in understandable form is available to the public. On the educational side we can report that a much more highly vitalized curriculum and better teaching methods are on the ascendency in elementary schools.

GENERAL PRINCIPLES IN HEALTH TEACHING

To set up some general principles for working out a good health-teaching program I would suggest these:

1. Tie all dental health teaching into the whole school-wide program of social study, instead of carrying it along as another parallel line of work, or squeezing it in around the edges of a full day. This matter is of sufficient importance that administrators, health experts and teachers should get together and decide what the learnings are that are important to teach during the elementary years. These learnings should be well planned and given a real place in the curriculum. At this point educators may have to be a bit more flexible and put some of this teaching in as science, if appropriate, others as social studies.

2. There is an urgent need for first-class reading materials for children's use. Many of our present health readers are not interesting, are too didactic or too moralistic. They do not, as yet, approach in attractiveness and in vitality the newer books coming out in the social studies and science fields.

3. Better teacher-motivation is necessary. Teachers are not yet alive to the possibilities of this material. Better materials and a better place for health in the curriculum will help this situation.

4. Child motivation must make greater appeal to the intelligence of children and their undoubted interest in learning about the world around them. A questionnaire sent to several hundreds of teachers a few years ago demonstrated the fact that teachers resorted to offering material rewards to get children to take care of their teeth—a sad commentary upon teaching methods. While we cannot be too idealistic to be practical, we know that a really high type of teacher does not need to resort to bribes. Recognition of effort and success the child cannot do without, but rewards are different. Competition between children of unequal possibilities is not so good a motive to appeal to as competition with one's own previous efforts.

5. The whole family must be included in the program. Measures that are suggested usually require the cooperation of the home to insure success.

It is evident that the teaching of dental health to children as it should be is yet to come. It will be another year or more before adequate teaching material will be available. It will be presented years before its good effects will be noted. In the meantime, our continuous daily efforts should promote the dental health education of every dental patient and every lay audience that we contact.

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COUNCIL ON DENTAL EDUCATION

REQUIREMENTS FOR THE APPROVAL OF A DENTAL SCHOOL*

(Adopted October 19, 1940)

THE aims and purposes of the Council on Dental Education were announced in 1939 as follows:

a. To correlate in accord with the evolution of scientific knowledge, clinical experience, and social and economic conditions—the procedures of dental education with the problems involved in meeting oral health needs—and to interpret the relations of dental education to the dental profession and to the public.

b. To organize and administer criteria for accreditation of institutions for the study of dentistry in the United States.

This will include consideration of:

(1) *predental* education, and requirements for admission to dental schools;

(2) *undergraduate* dental education, and requirements for the D.D.S. or D.M.D. degree in dental schools;

(3) *graduate* and *postgraduate* education in dentistry and requirements for the accreditation of specialists in dental practice; and

(4) *such other educational activities* as may come within the Council's jurisdiction.

c. To list recurrently for publication the acceptable agencies of dental education, in a manner to give the dental profession and the public authoritative information.

d. To facilitate effective coordination of the efforts of dental schools, dental state boards, and dental societies toward maintenance of adequate standards of professional proficiency.

e. To promote more complete understanding—in universities, in medical schools, and by the public—of the current needs of progressive dental education and dental research in the public interest, and to stimulate the continual development of dental education.

f. To inform the dental profession regarding the nature and scope of the current problems of dental education, and of the conditions and procedures for their solution.

g. To foster constant improvement in the methods of teaching in dental schools, and to encourage the establishment of conditions that would attract an increasing number of men of outstanding ability to the career of dental teaching.

h. To study the educational needs of the practitioner and to recommend ways and means by which he may be provided with opportunities for organized study to maintain proficiency.

This bulletin deals with criteria for the approval of dental schools as contemplated in the aims and purposes of the Council. This announcement is released before January 1, 1941, in accordance with the initial plans of the Council. The administration of the criteria will begin at the opening of the academic year 1942-1943, when inspection of dental schools applying for approval will be undertaken. The time from January 1941 to September 1942 will provide opportunity for the schools to study the requirements, to confer with the Council, and to make such adjustments as they may deem desirable.

UNIVERSITY RELATIONSHIP

The Council believes that dental edu-

*One of the chief functions of the Council on Dental Education is the establishment of a list of approved dental schools in the United States. The Council issued in April 1939 a statement of its aims and purposes and outlined the principles which would guide it in evaluating dental schools. The Requirements for the Approval of a Dental School now announced more specifically outline the standards which the Council will administer with the opening of the academic year 1942-1943 in determining the approval of dental schools.

cation will thrive best under university auspices and that no dental school can be successfully and satisfactorily conducted as a business enterprise. The Council will therefore expect any dental school which seeks its approval to be incorporated strictly as a non-profit institution. Whatever the historical background and corporate entity of a dental school, and whatever the sources of its support, its functioning educationally as an integral part of an accredited university will be regarded as of fundamental importance. The Council will not be satisfied with the nominal or casual affiliation of a dental school with a university, but will expect its administration, its teaching and its research to be conducted as a university discipline in harmony with the purposes and methods of higher education. This view contemplates the recognition and acceptance of a dental school by the university of which it is a part on equal terms with the university's other professional schools, and anticipates that the dental school shall live up to the traditions and shall sustain the standards of scholarship, the exactness and thoroughness of scientific endeavor and the true university spirit of its parent institution.

FINANCIAL MANAGEMENT AND SUPPORT

The Council will survey the financial management and support of a dental school from the standpoint of its announced objectives and unqualifiedly upon educational premises. Consideration will be given to the adequacy and certainty of the income from endowments, from appropriations and from all other sources, and to the relation of the income from fees and charges of all descriptions to the total budget. The clinical and infirmary service should be predicated upon the educational program and teaching needs of the institution and not upon receipts from fees. The actual utilization of the entire income primarily for the enrichment of teaching and the advancement of research will be closely viewed. The expenditure per student, the day by day management, and the availability of clear cut records of all financial transactions, covering endowment, resources, capital investments, receipts, expenditures and indebtedness, will also be surveyed by the Council.

PHYSICAL PLANT

The physical plant and equipment should be adequate to meet the requirements implied in the institution's objectives. Examination of the physical plant and equipment will include consideration of buildings, classrooms, laboratories, clinics, and their equipment; ventilation, heating, lighting, cleanliness, and other features which contribute to effective functioning.

ENROLMENT

The number of students enrolled in a dental school should be in keeping with its physical facilities, its faculty, and administrative personnel. The Council will regard over-crowding in any class or in the institution as a whole, as a factor operating against the attainment of sound objectives.

PROMOTION AND GRADUATION

The primary basis for promotion and graduation should be achievement in all phases of the curriculum. While the Council recognizes the value and necessity of quantitative lecture, laboratory and clinical requirements in insuring reasonable repetition and experience in a variety of projects, it nevertheless holds that the progress of the individual student should be chiefly measured by the quality of his work apart from the accumulation of points and credits.

LIBRARY

The Council regards adequate library facilities as essential in any program of dental education. The enlarging content of the curriculum, the encouragement of independent study, and the demands of

research create a continuous need for the accumulation and the intelligent use of the printed resources of dentistry and its related sciences. The library resources of a dental school should be broad enough to meet the teaching and research needs of the institution. The dental library whether established separately or as a section of a combined library should be clearly defined as a dental collection, and should be well housed, conveniently located, and open for the use of students and faculty at all reasonable hours. It should be administered by a professionally trained or experienced librarian and should be adequately sustained, both for operation and for the purchase of additions. The Council will take into account the relationship which prevails between the library and the teaching and research activities of a dental school, and will expect to find the library, without compulsion, indispensable to both students and faculty and one of the principal agencies for the promotion of live instruction.

ADMISSION

The Council fixes as the minimum basis for admission to an approved dental school the successful completion of two full academic years of work in an accredited college of liberal arts and science. This admission requirement is applicable to students admitted to dental schools beginning with the academic year 1942-1943. The college course must include at least a year's credit in English, in biology, in physics, and in inorganic chemistry, and a half year's credit in organic chemistry. All courses in science should include both class and laboratory instruction. Formal credit in any of these subjects, except in chemistry, may be waived in the case of exceptional students with three years of college credit or in the case of those holding a bachelor's or other degree from an accredited college.

By an accredited college, the Council means an institution approved by the Association of American Universities or by one of the following regional accrediting agencies:

Middle States Association of Colleges and Secondary Schools

New England Association of Colleges and Secondary Schools

North Central Association of Colleges and Secondary Schools

Northwest Association of Secondary and Higher Schools

Southern Association of Colleges and Secondary Schools

For the benefit and guidance of dental schools, the Council will publish at the end of each academic year lists of the colleges approved by these accrediting agencies. The admission of a dental student from a college not within the territory or jurisdiction of an accrediting body may be sanctioned by the Council in extraordinary or special cases after ample evidence has been furnished concerning the quality and character of the instruction in the institution in question.

In reviewing the administration of the announced entrance requirements of a dental school, the Council will wish first to know that the quantitative requirement here indicated has been faithfully met. It is the opinion of the Council, however, that the selection of students for admission to dental schools should be based on estimates of their capacity for success in the study of dentistry as determined by evaluation of all available and significant information. Consideration of the qualifications of applicants for admission should include information regarding their character, their knowledge, their educational history, the quality of their collegiate training, their health and their aptitude for and interest in the study of dentistry.

The concern a school shows about the human equation in determining whether an applicant should be permitted to enter upon dental study will be viewed quite as earnestly as the enforcement of the requirement that he shall present an

acceptable scholastic record. As a further aid in the selection of students, the Council is disposed to urge dental schools to devise and employ aptitude tests whenever they find such tests useful. The Council will require approved dental schools to submit annually specific information regarding the entrance credits and scholastic standing of all first year students accepted.

INSTRUCTION

Instruction upon all levels in a dental school should be conducted upon the premise that dental education must meet the tests of a true university discipline. This assumption at once places the primary responsibility for achievement upon the individual student. The student should be expected to conform to the unavoidable routine and orderly procedure of the school and faithfully to meet the necessary class and laboratory assignments; but all the instruction should be consciously directed toward the development of initiative in the individual, toward stimulating the growth of the capacity for independent thought and action, resourcefulness, and a spirit of intelligent inquiry. Freedom of the student to conduct himself as a responsible adult and as an independent learner should take precedence over fixed requirements, rules and regulations.

All instruction should recognize the now indisputable and challenging fact that the content and procedures of dental education should presuppose that adequate dental service must serve biologic ends. It is therefore essential that students acquire understanding and appreciation of oral and systemic relations in both health and disease; of the biologic significance of restorative and replacement procedures; and of the interdependence of the dentist and the physician in meeting health needs. This conception does not minimize the importance of the technical phase of dentistry, but it does recognize oral diseases and disorders as major health problems and makes imperative the thorough training of the student in biologic fields.

The need for thorough research into the causes of oral disease and into the problem of the promotion of oral health is universal and compelling. Therefore every dental school, whatever its stated objectives, should be animated by the spirit of inquiry. The mere prosecution of routine class and laboratory assignments is purposeless without genuine scientific approach; no dental school fulfils its mission unless the spirit of research permeates the activities of both teachers and students and unless its graduates go out into dental practice inspired and prepared to explore the unknown fields that beckon them in their chosen profession.

HOSPITAL RELATIONSHIP

It is the opinion of the Council that an effective working relationship with an approved general hospital is essential to satisfactory instruction in a dental school. This relationship should be such as will afford the student opportunities for viewing conditions not usually common to the clinic of the dental school and for broadening his knowledge of oral and systemic relations in health and disease, thereby adding emphasis to the significance of dentistry as an important health service.

If the university of which a dental school is an integral part also conducts a medical school, the Council will be especially solicitous as to the cooperative relationships between the medical and the dental faculties, and will expect to find the dental school enjoying freedom of access to the university or affiliated hospital.

FACULTY

The university relationship of the dental school presupposes a thoroughly trained faculty, competent in terms of its stated objectives and organized for

effective teaching. The Council will be concerned about the general education, professional training and teaching experience of all members of the dental faculty and about the productive scholarship of the faculty as a whole. It will not set up specific regulations governing the ratio of teachers to students, the teaching load of individual members of the faculty, or venture upon any step calculated in any way to reduce dental schools to a fixed type or pattern; but will expect that recognized university practices will prevail in all matters of organization, procedure and management. The Council will, however, be concerned about the number of members of the faculty who give their full time to the institution. While the Council believes that active practitioners of dentistry who teach part time bring to a dental school a freshness of outlook and a practical viewpoint of great value, which should not be lost, it recognizes the fact that teaching is in itself a profession and that the trend in professional education on the university level is toward the wider employment of trained persons disposed to devote their lives singly to teaching and research.

Specifically, in surveying the faculty the following features will be examined: number and educational qualifications of teachers, teaching load, the number of teachers in relation to the number of students, faculty scholarship, research activities, organization, remuneration, tenure and security.

CURRICULUM

One of the major tasks which confronts the Council in establishing a list of approved dental schools is to be found in its evaluation of the curriculum of each institution. The Council will consider the clearly stated objectives and purposes of the individual school, what it seeks to accomplish for the student, for the profession, and for the public, and how well it succeeds in realizing and accomplishing its objectives and purposes. Inasmuch as no curriculum has enduring value, the curriculum of each dental school is to be judged finally not by its conformity to type, not by mechanistic measurements, not by the announced length, breadth and depth of its course of study but in terms of its achievement of its own stated ends.

The organization of the curriculum should be flexible and should be based on appreciation of dentistry as a growing and expanding science. It should afford opportunities for adjustments to advances in knowledge and for constant investigation and research relative to its value in the educational program. The amount of time assigned to the several subjects of the dental course should be determined by their respective contributions to the aims of dental education, to the effectiveness of the instruction, and to the time required by students for independent study. The curriculum should be conceived of as a unit and in terms of the interdependence of its related parts. Correlation of the various courses is essential to an effective educational program as well as to satisfactory student achievement. The curriculum should be balanced in the sense that it does not overemphasize the content at any point but rather gives proportional representation in terms of public dental needs and the aims of dental education to the various areas of knowledge in diagnosis, in prevention, in therapeutics and in prosthesis.

The efforts of the Council will be to encourage and foster intelligent curriculum experimentation, the development of institutional individuality and the achievement of excellence without the establishment of uniformity. In the evaluation of a curriculum, the Council will therefore not place reliance upon arbitrary pattern, inflexible standards or exact quantitative means of measurement.

Although the Council desires to avoid the appearance of any effort to stand-

ardize the curriculums of dental schools, it feels that it is desirable in the present stage of dental education to undertake to reach common agreement upon the minimum and maximum limits of the four-year course in terms of clock hours. This conclusion is reached on the one hand because of the breadth of material in the expanding body of knowledge, which must enter into any well-balanced program of dental education; and on the other hand by the tendency of some schools to over-load the program beyond the capacity of any student, however brilliant, to accomplish the objectives set forth. The Council desires to emphasize the importance of giving the individual student adequate time for study and recreation.

Subject to change in the light of future experience and with the profound hope of not appearing to be dogmatic, the Council prescribes a four-year dental course of not less than 3,800 clock hours and not more than 4,400 clock hours, distributed in such a way as to provide at least ten free hours each week, and announces that it will not be disposed to consider for approval a school which goes outside these limits in either direction.

Holding the view also that the present stage of dental education calls for effort to reach common agreement upon the minimum range of the curriculum, the Council will expect to find in a dental school course at least the following subjects:

Anatomy—Gross and Oral—Histology and Embryology
Physiology
Biochemistry
Bacteriology
Pharmacology
Pathology
Medicine
Diagnosis, including Radiography
Orthodontics
Operative Dentistry, including Periodontia and Pulp Canal Therapy
Prosthesis
Oral Surgery, including Anesthesia—General and Local
Dental Materials
Public Health and Hygiene
History of Dentistry
Conduct of Practice
Ethics
Jurisprudence

STATEMENT OF GENERAL POLICY

The Council on Dental Education has adopted the policy that administration of the foregoing principles and criteria shall be free from the coercive factors of regimentation and dictation. Although the primary purpose of the Council is accreditation, it will, in fulfilling this function, undertake to encourage and to aid dental schools to meet its requirements. In order to afford dental schools time to make such adjustments as may be necessary to meet the requirements outlined, visits to dental schools with a view to approval will not begin until the opening of the academic year 1942-1943. Meanwhile, the Council will assemble pertinent data concerning each school which invites consideration. The final appraisal of a school will be determined in the light of the total pattern it presents, and excellence in certain particulars may compensate in some degree for possible deficiencies in others capable of correction.

The efforts of the Council to establish a list of approved schools will be conditioned by an attitude of constructive cooperation; therefore the Council will welcome inquiries relative to interpretation of its stated principles and criteria and will respond willingly to solicitations for advice and for guidance in the solution of a dental school's individual problems. To the end that it may achieve its aims and contribute to the advancement of dental education and to the improvement of the dental profession in the United States, the Council earnestly solicits the cooperation of the administrators and faculties of universities and of dental schools.

COUNCIL ON DENTAL THERAPEUTICS

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following article in the list of Accepted Dental Remedies.

Calcium Carbonate*

Wyandotte Precipitated Calcium Carbonate: Wyandotte Precipitated Calcium Carbonate complies with U.S.P. XI. It is used in the manufacture of dentifrices.

Manufactured by the Michigan Alkali Company, Wyandotte, Mich.
CHEMICAL ANALYSIS: 98.90 per cent calcium carbonate.
PHYSICAL PROPERTIES:
Specific Gravity: 2.68 as determined by the A.S.T.M. Method D 153-39 method A. (Details filed with Council.)
PARTICLE SIZE:

Less than 5 microns	5-10 microns	10-20 microns	Over 20 microns
89%	10%†	1%†	Occasional†

Abrasiveness: The abrasiveness of Wyandotte Calcium Carbonate was determined by rotating a polished surface of antimony in a slurry of chalk and water under a weight of 63 gm. for 6,480 revolutions on a test machine (details filed with Council.) The area of the metal specimens exposed was 53 sq. mm. and the Bierbaum hardness was 236 units for antimony. The following weight loss occurred: 1.3 mg.

Admission of an article to the list of Accepted Dental Remedies does not imply a recommendation. Information regarding the rules and work of the Council will be sent on request.

HAROLD L. HANSEN, *Secretary.*

*A.D.R. Ed. 6, page 100.
†Most of these particles are actually aggregates of very fine particles.

COMMITTEE ON LEGISLATION

ARMY PROFESSIONAL EXAMINATIONS

A CONGRESSIONAL bill to authorize the discontinuance of professional examinations for promotion in the Regular Army of officers of the Medical, Dental and Veterinary Corps during time of war or emergency, declared by Congress and recommended by the War Department, was passed by the House and Senate and signed by the President November 29. This legislation grants authority to the Secretary of War, until May 15, 1945, at his discretion, to dispense with examinations for promotion in these corps, excepting physical examinations.

Section 24c, National Defense Act, as amended, repealed all laws providing for examination for promotion, other than physical examination, of all officers of the Regular Army except officers of the Medical, Dental and Veterinary Corps.

THE RELIEF COMMISSION

ANNUAL REPORT OF THE RELIEF COMMISSION 1939-1940

IN looking back through the records of the activities of the Relief Commission, it is possible to see the gradually broadening field which we are reaching. Four years ago, members of eighteen state societies were given assistance; the next year, twenty-one state societies, and last year, twenty-five. This year, we are pleased to report the participation of thirty state societies. This increase is most encouraging, as it would lead one to believe that the general membership of the American Dental Association has become better acquainted with the work that the Relief Commission is trying to do.

Further increase of this interest was one of the main reasons that an exhibit was placed in the Scientific and Health Section of the national meeting in Milwaukee last year. The work of the Relief Commission was shown in conjunction with that of the Dental Relief Fund Committee, since the two are closely allied. Shortly after the Milwaukee meeting, a letter was received from Frank L. Hart, chairman of the Scientific and Health Exhibits of the Golden Gate Dental Congress, saying that "we would be very happy to have your material for exhibit purposes, particularly as one of the features of this meeting is to be a section on dental education." The material was sent to California for this convention and, on the request of the Chicago Dental Society, it was shown at the Midwinter meeting in February. From there, it was sent direct to the Minnesota State Dental Association meeting, on the request of L. M. Cruttenden, state secretary, who wrote, "We are planning on a section at our annual state meeting this year to be devoted to dental association activities. We want to make a sincere effort to impress the dentists who attend the meeting with the value of their membership."

In December, a radio script was prepared for Lon W. Morrey, for a broadcast from Elkhart, Ind. A brief history of the Relief Fund was given, with a few general statistics and the circumstances of one or two of the most interesting cases.

It would seem that financial assistance for rehabilitation purposes following flood and hurricane has become a regular activity of the Relief Commission. Three years ago, we were called upon for help after the Ohio and Mississippi River Valley flood, and a year or so later we were able to offer assistance to the New England states. In April of this year, Glen S. Phillips, president of the Pennsylvania State Dental Society, contacted the Relief Commission on behalf of their members who had received injury during the spring floods. Emergency payments of $50 each were sent to three members, on recommendation of the state society.

During this year, several requested applications sent to the members were never returned to the secretary's office. We have had but one request for an outright loan, which was in the amount of $36,000. An explanatory letter was written to this member, stating that the Relief Commission was not empowered to make loans. Only one application was refused by the Relief Commission, that of a widow who was not eligible to receive assistance from the American Dental Association.

Word was later received that she was being given aid from the state dental relief fund.

The total amount granted this year was $13,960.00; total amount paid on last year's grants, $5,593.30; total

CHRISTMAS SEAL RECEIPTS AND RELIEF PAYMENTS DURING YEAR

		Contribution	Per Capita	Relief Payments
1.	Alabama	$ 405.10	$1.09	$ 300.00
2.	Arizona	82.50	.85	
3.	Arkansas	39.10	.19	
4.	Army	415.50	1.81	
5.	California	674.00	.39	940.00
6.	Colorado	178.00	.36	10.00
7.	Connecticut	503.00	.56	400.00
8.	Delaware	30.00	.48	
9.	District of Columbia	694.00	1.56	250.00
10.	Florida	342.50	.70	
11.	Foreign	8.00	.53	
12.	Georgia	171.75	.39	
13.	Idaho	39.00	.39	
14.	Illinois	2,104.58	.48	1,565.00
15.	Indiana	400.50	.35	190.00
16.	Iowa	570.20	.49	610.00
17.	Hawaii	79.00	.48	
18.	Kansas	312.15	.51	250.00
19.	Kentucky	278.50	.51	300.00
20.	Louisiana	127.20	.31	120.00
21.	Maine	91.00	.41	
22.	Maryland	211.00	.50	67.50
23.	Massachusetts	727.50	.31	775.00
24.	Michigan	569.80	.32	
25.	Minnesota	829.60	.48	540.00
26.	Mississippi	108.50	.45	
27.	Missouri	1,380.50	.99	500.00
28.	Montana	104.50	.52	218.00
29.	Nebraska	260.90	.46	273.50
30.	Nevada	12.00	.32	
31.	New Hampshire	78.00	.47	
32.	New Jersey	947.15	.47	345.00
33.	New Mexico	60.00	.68	
34.	New York	3,736.60	.72	1,570.00
35.	North Carolina	252.50	.45	
36.	North Dakota	87.65	.50	100.00
37.	Navy	87.00	.45	
38.	Ohio	1,114.50	.45	270.00
39.	Oklahoma	259.75	.52	
40.	Oregon	226.15	.51	120.00
41.	Pennsylvania	1,427.50	.41	878.50
42.	Public Health Service	46.00	.37	
43.	Philippine Islands	0		
44.	Puerto Rico	16.00	.20	
45.	Rhode Island	102.00	.39	
46.	South Carolina	59.00	.28	54.00
47.	South Dakota	46.00	.25	75.00
48.	Southern California	841.75	.48	850.00
49.	Tennessee	490.00	.92	
50.	Texas	416.45	.34	625.00
51.	Utah	247.00	1.02	
52.	Vermont	30.00	.27	
53.	Virginia	265.50	.50	150.00
54.	Washington	345.96	.47	725.00
55.	West Virginia	174.00	.47	
56.	Wisconsin	565.50	.35	623.30

57.	Wyoming	48.00	.62	
58.	Veterans Administration	87.00	.75	
59.	Panama Canal Zone	14.00	.67	
60.	Commercial Houses	146.00		
		$23,966.84*		$13,694.80

*Of total receipts, $11,504.21 has been contributed to qualified state societies. The balance available for relief purposes June 30, 1940 is $87,199.55.

GRANTS 1934-1940

Year	Granted	Paid	No. Applicants
1934–1935	$ 4,655.96	$ 4,298.60	23
1935–1936	9,469.52	5,856.96	43
1936–1937	10,118.70	8,125.66	50
1937–1938	10,841.00	9,949.10	57
1938–1939	14,828.96	12,345.66	72
1939–1940	13,960.00	13,694.80	72

Christmas Seal Receipts

1934–1935	$15,574.97
1935–1936	18,389.32
1936–1937	20,739.87
1937–1938	23,873.54
1938–1939	23,152.65
1939–1940	23,966.84

amount paid on this year's grants, $8,101.50; making a total paid this year of $13,694.80.

Eighty-three grants were made to seventy-two applicants, forty-six of these grants being renewals. Six of these grants were made to widows. Members of thirty state societies participated in the benefits of the Relief Fund this year.

Your secretary wishes at the close of this year to express his thanks and his appreciation to Charles P. Grosby, our chairman, and each member of the Commission for their whole-hearted cooperation during the past year, and also to our friends, John G. Hildebrand and Olin Kirkland, who, owing to their long experience as members of this Commission, have been very helpful in an advisory capacity.

The secretary's office also has been shown every courtesy and received close cooperation from the officers and assistants at the Central Office. It is our dream that the Relief Commission may warrant, through its service, a continued growth and, in the future, be able to more generally and universally benefit our entire membership.

Respectfully submitted,

E. E. GRAHAM, *Secretary*
58 E. Washington St., Chicago, Ill.
CHARLES P. GROSBY, *Chairman*
R. HOLMES MASON
WALTER S. THOMPSON
JOHN S. OWENS
Committee

DENTAL ECONOMICS

DENTAL INTERNSHIPS AND RESIDENCIES

BECAUSE of the large number of requests for information as to hospitals providing dental internships, the Committee on Economics has compiled and maintained a list of such hospitals for several years. The information presented at this time was obtained in reply to a questionnaire sent on August 16, 1940 to all of the hospitals approved for training interns by the Council on Medical Education and Hospitals of the American Medical Association, June 1, 1940, and which were listed as providing dental as well as medical intern training.

The distribution of questionnaires was restricted to the hospitals on the foregoing list because no list of hospitals approved for dental internship was available and it was believed to be unlikely that many dental internships were offered in hospitals not on this list.

Questionnaires were sent to 149 hospitals and replies were received from 137. Of this number, 131 hospitals provide training for 236 dental interns, or an average of 1.8 per hospital. Nearly all of the internships begin in July and continue for one year.

Competitive examinations for available positions are conducted by about 25 per cent of the hospitals. The remaining 75 per cent employ other methods of selection.

There is a wide range in the compensation given dental interns. The highest salary is $2,000 a year and the lowest no salary and only partial maintenance. Forty-three hospitals provide maintenance only. Eighty-one provide maintenance plus a salary or bonus ranging from $4 to $62.50 a month, and thirteen hospitals pay a salary only.

To the question as to whether the dental interns work in the outpatient department of the hospital, 115 replied that they do. Four hospitals stated that the interns do not work in the outpatient department. In only five hospitals are the interns supervised by physicians rather than dentists.

Most of the hospitals seem to provide quite extensive training in various types of dentistry, but an evaluation of the quality of the training cannot be made from the information obtained in this questionnaire. The questionnaire was not designed for this purpose and the information obtained on this phase of internship is merely to provide a guide to students interested in applying for particular types of training. Because of its increasing importance, this phase of dental education merits a thorough study, with establishment of standards to protect the dental intern and the profession.

DENTAL RESIDENCIES

Among the replies to the questionnaire on dental internships was some additional information on dental residencies, which are provided by thirty-three of the hospitals on the internship list. The list of available residencies in dentistry is included in this report because there seems to be an increasing interest in this subject. Most of the residencies available at the present time are for special training in oral surgery, although some of them are for other types of dentistry.

TABLE 1.—DENTAL INTERNSHIPS—1940

State & Hospital	Location	No. of Beds	No. of Interns	Application Date	Competitive Examination	Compensation	Type of Work	Supervision
ALABAMA								
Hillman	Birmingham	488	1	November	No	Maintenance	Extractions, etc.	Staff members, chief residents
CALIFORNIA								
Alameda County	Oakland	456	1	November	No	$20 a month & maintenance		Visiting staff
Mount Zion	San Francisco	161 161	3 3	Any time	No	$50 a month	Surgical, x-ray, operative & prosthetic; orthodontic (separate internship)	Chief & associate chief
San Diego County General	San Diego	673	1	Before November 1	No	$20 a month & maintenance	Examination of patients, assisting in oral surgery, work in outpatient clinic	Chief of staff & oral surgeon
San Francisco City & County	San Francisco	1,400	2	Before June 1	No	$72 a month	Emergency treatment, routine examination of patients, surgery, anesthesia, restorative service, prophylaxis	Visiting staff
United States Marine	San Francisco	478	3		No	$62.50 a month & maintenance	All types of dentistry under supervision of commissioned officer	Yes
Los Angeles County General	Los Angeles	3,448	2		Yes	$10 a month & maintenance	Exodontia, anesthesia, x-ray diagnosis, etc.	Director of hospital, dental director
CONNECTICUT								
Hartford Municipal	Hartford	175	2	November 15	No	$10 a month & maintenance	Children's dentistry, operative; exodontia, minor oral surgery, prosthetics	Dental clinic director
Hartford	Hartford	620	1	November 15	No	Maintenance	Extractions, dental surgery, x-ray, anesthesia, diagnosis, prophylaxis	Chief of staff & dental staff
St. Francis	Hartford	475	1	September 1 November 15	Oral	Maintenance	All types of dental work	Oral surgical staff

TABLE 1.—DENTAL INTERNSHIPS—1940 (Continued)

State & Hospital	Location	No. of Beds	No. of Interns	Application Date	Competitive Examination	Compensation	Type of Work	Supervision
New Haven	New Haven	571	2		No	Maintenance	All types	Chief of dental staff
St. Mary's	Waterbury	226	1	September	No	$25 a month & maintenance	Outpatient dept. dental work on ward patients, assist on private oral surgery cases	Visiting man on service
DISTRICT OF COLUMBIA								
Freedmen's	Washington	406	1	November	No	$10 a month & maintenance	Oral surgery, no restorative work	University dental school
Georgetown	Washington	260	1	December 15	No	Monthly salary & maintenance	Assists at all surgical operations involving oral cavity, attends all staff & clinical pathologic conferences	Staff & faculty of dental school
Providence	Washington	300	1	November 15	No	$10 a month & maintenance	Extractions, fractures	Staff doctor
St. Elizabeth's	Washington	6,500	1		Yes	$2,000	All types of dental service	Full-time dentist
FLORIDA								
Jackson Memorial	Miami	500	1		No	$20 a month & maintenance	Exodontia, fracture & other dental surgery	Dental staff
GEORGIA								
Grady	Atlanta	646		July	No	$10 a month & maintenance	Exodontia, oral surgery & a few fillings	
ILLINOIS								
St. Luke's	Chicago	527	1	October 1	No	Maintenance	Oral surgery	Attending men
University of Chicago Clinics	Chicago	512	4	Prior to March 1	No	Maintenance	All types, anesthesia, etc., and thesis	Frequent personal discussions
United States Marine*	Chicago	301	2	Prior to July 1	No	$62.50 a month & maintenance	Operative & prosthetic dentistry, exodontia; assist with fracture work	Commissioned officer of U.S.P.H.S.

TABLE 1.—DENTAL INTERNSHIPS—1940 (Continued)

State & Hospital	Location	No. of Beds	No. of Interns	Application Date	Competitive Examination	Compensation	Type of Work	Supervision
INDIANA								
Indiana University	Indianapolis	604	1	April 1	No	$12.50 a month & maintenance	Non-rotating; children's operative; adult exodontia, periodontia, oral surgery & diagnosis	Supervisor of interns
Indianapolis City	Indianapolis	724	1	September-November	No	$125 a year & maintenance	Exodontia, reduction of fractures of jaw	Yes
IOWA								
University of Iowa	Iowa City	900	2	September 1	No	$125 ($250 a month in children's dentistry) & maintenance	General examination; extraction & oral surgery	Yes
LOUISIANA								
Charity	New Orleans	3,300	1	October 31	No	$10 a month & maintenance	Fractures, extractions, no orthodontia, fillings or dentures	Dental residents, visiting staff connected with Loyola U. School of Dentistry
United States Marine*	New Orleans	574	5		No	$62.50 a month & maintenance	All types of dental service	Chief dental officer
MARYLAND								
Baltimore City	Baltimore	2,200	2	November 1	No	Maintenance	Prophylaxis, extractions, jaw fractures, some repair work	Daily visiting dentist
Johns Hopkins	Baltimore	900	2	January 1	No	Maintenance	Principally oral surgery	Chief of dental staff
Maryland General	Baltimore	259	1	September to November	No	$10 a month & maintenance	Oral surgery	Chief of dental department
United States Marine*	Baltimore	531	3	January 1	No	$62.50 & maintenance	General practice of dentistry	Commissioned officer
University	Baltimore	435	1	November 1	No	Maintenance	Extractions, treatments and treatment of fractures	

TABLE 1.—DENTAL INTERNSHIPS—1940 (Continued)

State & Hospital	Location	No. of Beds	No. of Interns	Application Date	Competitive Examination	Compensation	Type of Work	Supervision
MASSACHUSETTS								
Boston City	Boston	2,509	3	October 19	Yes	Maintenance	Exodontia, x-ray, oral surgery	Chief of oral surgery & 20 assistant visiting staff men
Massachusetts General	Boston	469 (General Hospital)	1	Any time	No	Maintenance	Extractions & dressings	Visiting men on duty
Peter Bent Brigham	Boston	250	1	February 1	No	Maintenance	Management of dentomedical problems in diagnosis of oral lesions & surgery of the mouth	Staff
Salem	Salem	185	1	December	No	$25 a month & maintenance	Oral surgery, extractions, emergency fillings, prophylaxis, periodontoclasia, dental radiography, tumor clinic	Yes
Worcester City	Worcester	480	2		No	Maintenance		Dentist on staff
MICHIGAN								
Henry Ford	Detroit	600	1	June 30	No	$125 a month	Oral surgery	Dentist in charge
Grace	Detroit	585	2	January-June	No	$25 a month & maintenance	All procedures followed—dentures, extractions and instruction under supervision of oral surgeon	Oral surgeon
MINNESOTA								
Minneapolis General	Minneapolis	671	3	January 1	No	$7.50 a month & maintenance	General dentistry	Dental staff
University	Minneapolis	500	1	No definite date	No	Maintenance	Diagnosis, surgery, palliative treatment, & some operative dentistry for pediatric cases	Staff men
Ancker	St. Paul	850	1	November 15	No	Maintenance	Extractions, reparative & oral surgery	Yes

TABLE 1.—DENTAL INTERNSHIPS—1940 (Continued)

State & Hospital	Location	No. of Beds	No. of Interns	Application Date	Competitive Examination	Compensation	Type of Work	Supervision
MISSOURI								
Kansas City General No. 1	Kansas City	560	2	Prior to November 1	No	$20 a month & maintenance	Oral surgery & extractions, very little reconstructive work	Attending staff
St. Louis	St. Louis	1,000	1	November 1	No	$25 a month & maintenance	Anesthesia, surgery of mouth, extractions	Yes
NEW JERSEY								
Englewood	Englewood	238	1		No	$20 a month & maintenance	Extractions, assist with fractures of jaw, etc.	Dental attending staff
Jersey City Medical Center	Jersey City	1,400	21			Maintenance	All types except prosthetics	
Monmouth Memorial	Long Branch	211	1	Prior to January 1	No	$25 a month & maintenance	All types of dental service	Yes
Mountainside	Montclair	330	1	Any time	No	$15 a month & maintenance	Examinations, extractions, emergency fillings, prophylaxis, treatments, x-ray	Yes
Newark Beth Israel	Newark	455	2	December 15	Yes	$15 a month & maintenance	Orthodontia, periodontia, operative dentistry, x-ray, children's dentistry, surgery, prosthetics	Chief of section
Newark City	Newark	720	1	December 15	Yes	$20 a month & maintenance	Exodontia & oral surgery for hospital patients	Chief of staff
Muhlenberg	Plainfield	305	1	July 1-January 1	No	$25 a month & maintenance	X-rays, surgery, extractions, emergency treatment; service to ward patients	Directed in clinic by 2 clinical assistants
North Hudson	Weehawken	191	1		No	Maintenance	Extractions, temporary fillings, anesthesia	Yes
NEW YORK								
Albany	Albany	500	1	October 15	No	Maintenance	Prosthetics, exodontia, operative dentistry, diagnosis & oral surgery	Chief attending dentist & associates

TABLE 1.—DENTAL INTERNSHIPS—1940 (Continued)

State & Hospital	Location	No. of Beds	No. of Interns	Application Date	Competitive Examination	Compensation	Type of Work	Supervision
Binghamton City	Binghamton	550	1	November 1	No	$25 a month & maintenance	Oral surgery	Attending dentists
Beth Moses	Brooklyn	225	1	Christmas week	Yes (oral)	$15 a month & maintenance	Exodontia & oral surgery	Chief oral surgeon & medical director
Cumberland	Brooklyn	400	1	November 1	Yes	$18 a month & maintenance	Oral surgery, traumatic surgery, etc., except fillings & dentures	Visiting staff
Greenpoint	Brooklyn	300	2	September	Yes	$18 a month & maintenance	Exodontia & oral surgery, medical training & operating room instruction	Superintendent of hospital
Jewish	Brooklyn	660	1	October 15	No	Maintenance	Operative surgery	Visiting staff
Kings County	Brooklyn	2,400	5	March 1	Yes	$18 a month & maintenance	Anesthesia, all types of dental work	Medical superintendent of hospital & visiting dental staff
Buffalo General	Buffalo	475	1	November 1	No	Salary & maintenance	Oral surgery & extractions	Chief of department
Edward J. Meyer Memorial	Buffalo	1,063	6	November 15	No	$75 a month	Fillings, extractions, minor oral surgery, operative dentistry exclusive of gold work	Dental resident & educational supervisor
Mary Immaculate	Jamaica	316	2	March 1		Maintenance	Oral surgery, pathology, x-ray, general & local anesthesia	Visiting staff
Queens General	Jamaica Long Island	696	2	July 31	Yes	$18 a month & maintenance	Extractions & traumatic surgery	Members of visiting staff on oral surgery
Charles S. Wilson Memorial	Johnson City	350	2	November 15	No	$35 a month & $15 a month bonus & maintenance	General dental work, all inclusive	Experienced dentists

TABLE 1.—DENTAL INTERNSHIPS—1940 (Continued)

State & Hospital	Location	No. of Beds	No. of Interns	Application Date	Competitive Examination	Compensation	Type of Work	Supervision
United States Marine*	Stapleton	713	5	May 15	No	$62.50 a month & maintenance	Operations of a general nature	Chief dental officer, 3 commissioned officers available for consultation & advice
Grasslands	Valhalla	824	3	November 15	No	$35 a month & maintenance $180 bonus end of year	Extractions, some prothetics	Resident & attending physicians
Saint John's	Brooklyn	290	2	September	No	Maintenance	Assist attending dentists on cases; work in dental clinic	Attending dentists
Bellevue	New York	2,583	6	No definite date	No	$18 a month & maintenance	Dental surgery, extractions, restorations on cardiac & pregnant patients	Chief of staff
Beth Israel	New York	500	1	April 1	Yes	$15 a month & maintenance	All types, except bridgework or inlays	Senior members of staff
Bronx	New York	303	1	Christmas vacation	Yes	$50 bonus & maintenance	All branches of dentistry except dentures	Chief of department
Coney Island	New York	300	1	Prior to December	Yes	$20 a month & maintenance	Assist in all work, x-ray, extractions, minor oral surgery & fracture of jaws	Staff dentist
Fordham	New York	609	2	January 1	Yes	$15 a month & maintenance	All types of work	Visiting staff
Gouverneur	New York	200	2	Prior to December	Yes	$15 a month & maintenance	Oral surgery, exodontia, pathology and bacteriology, anesthesia (all types); operative dentistry on selected children; diagnosis	Visiting staff

TABLE 1.—DENTAL INTERNSHIPS—1940 (Continued)

State & Hospital	Location	No. of Beds	No. of Interns	Application Date	Competitive Examination	Compensation	Type of Work	Supervision
Harlem	New York	763	2	Examination in March	Yes (oral)	$18 a month & maintenance	Extractions, minor oral surgery	Chief & visiting staff
Hospital for Joint Diseases	New York	355	1	March 1	No	$15 a month & maintenance	Oral surgery, periodontia, orthodontia	Attending oral surgeon
Jewish Memorial	New York	173	1	May 15	No	Maintenance	Prophylaxis, fillings, surgery	Yes
Montefiore	New York	964	3	Fall	No	$25 a month & maintenance	Complete—all dental specialties	Visiting staff
Knickerbocker	New York	187	1	January 1	No	Maintenance	Dental & oral surgery	Attending staff
Lincoln	New York	400	2	December 25	Yes	$15 a month bonus & maintenance	Exodontia, anesthesia, examination of bed patients	Visiting staff
Morrisania City	New York	539	2	May	No	$18 a month & maintenance	Oral surgery, extractions & occasional fillings	Visiting staff
Metropolitan	New York	1,200	3	January 15	Yes	$15 a month & maintenance	Dental & oral surgery, diagnosis, x-ray, anesthesia, physical diagnosis, principles of medicine & surgery & clinical pathology	Attending staff
Mount Sinai	New York	856	2	Fall	Yes	Maintenance	All types of dentistry	Chief of services in dental clinic
New York City	New York	1,030	2	July-October	No	$18 a month & maintenance	Extractions & other dental surgery, prophylactic dentistry	Visiting dental staff
N. Y. Infirmary for Women & Children	New York	126			No	$10 a month & maintenance	All types except oral surgery	Director of the dental clinic
N. Y. Medical College, Flower & Fifth Avenue	New York	411	1			Maintenance	Oral surgery	Head of department of oral & plastic surgery

TABLE 1.—DENTAL INTERNSHIPS—1940 (Continued)

State & Hospital	Location	No. of Beds	No. of Interns	Application Date	Competitive Examination	Compensation	Type of Work	Supervision
N. Y. Polyclinic Medical School & Hospital	New York	426	3	Any time	No	Maintenance	Oral surgery, fractures, etc.	Visiting staff
N. Y. Post-Graduate Medical School & Hospital	New York	417	1			Maintenance	Oral surgery & orthodontia	Yes
Roosevelt	New York	398	1		No	Maintenance	Extractions, oral hygiene & referred work from other clinics	Dental staff
St. Luke's	New York	520	2	March 1	No	$25 a month allowance & maintenance	Anesthesia, operating room experience	Dental staff
NORTH CAROLINA								
Duke	Durham	609	1	April 1	No	Maintenance	Exodontia, oral surgery, consultation	Staff member
OHIO								
Cincinnati General	Cincinnati	965	7	January 1	No	Maintenance	Rotating: hospital oral surgery, outpatient clinic cases, anesthesia, work at tuberculosis sanatorium, children's hospital, chronic disease hospital & county infirmary	Dental resident & visiting staff
Mount Sinai	Cleveland	270	1	November 1	No	$10 a month & maintenance	Preoperative dental prophylaxis, gas anesthesia, minor oral surgical emergencies, exodontia, periodontia, some fillings	Yes
St. Luke's	Cleveland	391	1	March 1	If necessary	Maintenance	Dentures (full & partial), extractions, anesthesia, fractures, fillings, prophylaxis, Vincent's & pyorrhea treatments	Department head & members of dental staff

TABLE 1.—DENTAL INTERNSHIPS—1940 (Continued)

State & Hospital	Location	No. of Beds	No. of Interns	Application Date	Competitive Examination	Compensation	Type of Work	Supervision
University Hospitals of Cleveland	Cleveland	823	1	November 9	Yes	Maintenance	Oral surgical service including fractures	Chief of service & staff men
Youngstown	Youngstown	503	1	October 1	No	$25 a month & maintenance	General dental service	Dental staff
OKLAHOMA								
State University & Crippled Children's	Oklahoma City	438	1	January 1	No	$50 a month & maintenance	Everything except operative & prosthetic dentistry	Dental staff
PENNSYLVANIA								
Allentown	Allentown	375	1	After September 1		Maintenance	Fillings, temporary&permanent; treatments, supervision of oral hygienist	Chief of dental staff
Chester General	Chester	215	2	November 1	No	$15 a month & maintenance	Daily work in outpatient clinic cooperation with medical & surgical interns	Chief medical resident & dental staff
Saint Luke's	Bethlehem	216	1	Early fall	No	Maintenance & $100 annual bonus	Extractions, fillings, etc., fractures	Staff
Hahnemann	Philadelphia	728	2		No	3 months' maintenance	Exodontia, oral surgery	Dental staff member
Hospital of the Protestant Episcopal Church	Philadelphia	530	2	November 1	No	Maintenance	Oral surgery, orthodontia	Chief
Hospital of the University of Pennsylvania†	Philadelphia	528	1		No	Partial maintenance	Extractions, cleaning, temporary fillings & treatment	Official dentist & oral diagnostician of hospital
Jefferson Medical College	Philadelphia	688	1		No	Maintenance	Prophylaxis, oral surgery, maxillofacial surgery	Chief of department
Jewish	Philadelphia	476	2	Any time	Yes	Maintenance	Preventive care for children, surgery & prophylaxis	Yes

TABLE 1.—DENTAL INTERNSHIPS—1940 (Continued)

State & Hospital	Location	No. of Beds	No. of Interns	Application Date	Competitive Examination	Compensation	Type of Work	Supervision
Misericordia	Philadelphia	194	1	Prior to December	No	Maintenance	Complete dental service, fillings excepted	Chief of service
Mount Sinai	Philadelphia	317	1	September-December		Meals only	Oral surgery & emergency dental care	Members of dental staff
Northeastern	Philadelphia	102	1	March 1	No	$10 a month & maintenance	Minor oral surgery & operative	Chief of clinic staff
Philadelphia General	Philadelphia	2,500	1	April 1	Yes	Maintenance	Oral & dental surgery & all dental emergencies	Oral surgeon & visiting dentists
Pennsylvania	Philadelphia	560	2	February	No	Maintenance	Anesthesia, surgery & outpatient cases	Director of service
Presbyterian†	Philadelphia	356	2		No	Maintenance	Extraction & surgery	Chief or assistant
Germantown Dispensary & Hospital‡	Philadelphia	400	1				All types	Dental staff
Temple University	Philadelphia	468	2	Fall	No	Maintenance	All phases of dental work	Staff dentist
Allegheny General	Pittsburgh	596					Clinic & house service	
Western Pennsylvania	Pittsburgh	600	1	April 1	No	Maintenance	General dental & oral surgery	Dental resident & staff
Saint Francis	Pittsburgh	688	1	July 1	No	Maintenance & $50 bonus	All types	Yes
Reading	Reading	289	2	Prior to July 1	No	Maintenance	General outpatient work, including minor oral surgery	Chief of dental department
RHODE ISLAND								
Rhode Island	Providence	550	1	April 1	No	$15 at completion of internship; maintenance	Minor oral surgery, jaw fractures, operative dentistry, general anesthesia	Dental visiting staff

TABLE 1.—DENTAL INTERNSHIPS—1940 (Continued)

State & Hospital	Location	No. of Beds	No. of Interns	Application Date	Competitive Examination	Compensation	Type of Work	Supervision
TENNESSEE								
Baroness Erlanger	Chattanooga	500	1	November 15		$25 a month & maintenance	Extractions, treatments, oral hygiene	Yes
Knoxville General	Knoxville	312	1	December	No	$30 a month & maintenance	Oral surgery, general dental service except restorative	Staff dentists
Nashville General	Nashville	305	2	December 1	No	$20 a month & maintenance	Oral surgery, exodontia, general anesthesia	Yes
TEXAS								
Methodist	Dallas	140	1	Early fall	No	$25 a month & maintenance; $100 bonus	All dental work in outpatient department	Yes
Parkland	Dallas	400	1	April 1	No	$10 a month & maintenance	Exodontia, jaw fractures, jaw tumors, harelips, cleft palates	Staff of dental oral surgeons
City-County	El Paso	196	1	November 10	No	$25 a month & maintenance, $100 bonus	Exodontia, emergency treatment, jaw fractures	Dentists on staff
City-County	Fort Worth	186	1	September-October	Yes	$25 a month & maintenance	Exodontia & fracture work	Director of dental staff
Jefferson Davis	Houston	500	3	Before July 1	No	$25 a month & maintenance	Exodontia & gum treatment	Staff men
Robert B. Green Memorial	San Antonio	200	2	November 1	No	$10 a month & maintenance	General dentistry	Staff men
Scott & White	Temple	175	1	January 1	No	$50 a month & maintenance	Diagnosis & surgery only	Yes
VIRGINIA								
United States Marine*	Norfolk	360	3	November 1	No	$62.50 a month & maintenance	General dentistry	Commissioned dental officer

TABLE 1.—DENTAL INTERNSHIPS—1940 (Continued)

State & Hospital	Location	No. of Beds	No. of Interns	Application Date	Competitive Examination	Compensation	Type of Work	Supervision
Medical College of Virginia Hospital Division	Richmond	472	1	November 1	No	Maintenance	Exodontia & prophylaxis	Staff dentists
WASHINGTON								
King County	Seattle	Unit1 454 Unit2 267	1	Prior to November 1	No	$30 a month & maintenance	Oral surgery	Chief of oral surgery & others
United States Marine*	Seattle	400	2	January-February	No	$87.50 a month & maintenance	All phases of dentistry except orthodontia	Chief dental officer
WEST VIRGINIA								
Ohio Valley General	Wheeling	275	1	November 15	No	$25 a month & maintenance	Complete oral surgical service	Attending oral surgeon

*The United States Marine hospitals are under the jurisdiction of the United States Public Health Service. Some of their hospitals also have second year dental internships for which the compensation is $92.50 a month plus maintenance. Complete information can be obtained from the United States Public Health Service, Washington, D. C.

†Internships are restricted to University of Pennsylvania students.

‡Facilities for a dental internship, but no intern was appointed for the present year.

TABLE 2.—DENTAL RESIDENCIES

State & Hospital	Location	No. of Beds	No. of Residencies	Yearly Salary	Type of Work
CALIFORNIA					
San Diego County	San Diego	673	2 part time	$1,500	General dentistry except prosthetic and orthodontia
DISTRICT OF COLUMBIA					
Gallinger Municipal	D. of C.	1,117	1	$3,600	Oral surgery
Garfield Memorial	D. of C.	334	1	$120	Oral surgery
St. Elizabeth's	D. of C.	6,500	1	$4,400	All types
ILLINOIS					
Cook County	Chicago	3,525	2	$ 300	Oral surgery
Presbyterian	Chicago	412	1		Exodontia, prophylaxis, diagnosis
University of Chicago Clinics	Chicago	512	7	$1,500	All types

TABLE 2.—DENTAL RESIDENCIES (Continued)

State & Hospital	Location	No. of Beds	No. of Residencies	Yearly Salary	Type of Work
KENTUCKY					
Louisville City	Louisville	587	1	$1,152	Exodontia, oral surgery
LOUISIANA					
Charity Hospital of Louisiana	New Orleans	3,300	1	$600	All but orthodontia, fillings & dentures
MICHIGAN					
Grace	Detroit	585	1	$3,600	All types
Henry Ford	Detroit	600	1	$2,400	All types
MASSACHUSETTS					
Massachusetts Memorial	Boston	391	1	None	Exodontia
MICHIGAN					
University	Ann Arbor	1,300	1	$300	Oral surgery (3-year postgraduate training
MINNESOTA					
University	Minneapolis	500	1	None	Diagnosis, surgery, palliative treatments, some operative dentistry
NEW JERSEY					
Jersey City Medical Center	Jersey City	1,400	1	$1,200	All types
North Hudson	Weehawken	191	1	$180	Extractions, fillings, fractures
NEW YORK					
Buffalo General	Buffalo	475	1	$300	Oral surgery, extractions
Meyer Memorial	Buffalo	1,063	1	$2,580	All types
Beth Moses	Brooklyn	225	1	$180	Exodontia, oral surgery
Kings County	Brooklyn	2,400	1	$216	All types
Bellevue	New York	2,583	6	$180	Surgical orthodontia
Beth Israel	New York	500	1	$180	All types but bridgework & inlays
Lenox Hill	New York	605	1	None	Oral surgery
Metropolitan	New York	1,200	1	$1,200	Oral & maxillofacial
Grasslands	Valhalla	824	1	$1,830	Oral surgery
OHIO					
Cincinnati General	Cincinnati	965	1	$1,860	
OKLAHOMA					
State University & Crippled Children	Oklahoma City	438	1	$720	All types
OREGON					
U. Oregon Medical School	Portland	435	1	$480	Research, diagnosis and treatment
PENNSYLVANIA					
Allentown	Allentown	375	1	None	Extractions, fillings, treatment
Hahnemann	Philadelphia	728	1	None	Exodontia, oral surgery
Northeastern	Philadelphia	102	1	$120	Operative & oral surgery
Presbyterian	Philadelphia	356	2	None	Exodontia & oral surgery
West Pennsylvania	Pittsburgh	600	1	$1000	Dental & oral surgery
VIRGINIA					
Medical College of Virginia	Richmond	472	1	600	Oral surgery, exodontia

NEWS ITEMS

CLEVELAND HEALTH MUSEUM

NOT only commerce and industry, but also the professional groups have realized that good public relations are something worth while for both sides. The dental and medical professions have for years been developing a program of educational lectures, and have participated in many exhibits, especially in the large exhibits at the Chicago Century of Progress and at both world fairs in San Francisco and in New York.

The establishment of the Bureau of Public Relations by the American Dental Association demonstrated the importance and necessity of continuous sound health education. The healing professions have learned through experience that there is a correct way and an incorrect way to educate the laity. Goodwill and enthusiasm alone are not sufficient. There are certain technics to be followed in delivering a lecture; in writing a news letter or pamphlet; in addressing a radio audience; in making a movie, in order that it shall be entertaining, as well as instructive, and in designing an exhibit, in order that it shall be both pleasing and educational.

Health museums, as headquarters for lay education in individual and public health, have proved to be effective and worth while. Permanent health exhibits are now part of such institutions as the Buffalo Museum of Science and the Rosenwald Museum of Science and Industry in Chicago. The Medical and Public Health Exhibits of the New York World's Fair will be transferred to the American Museum of Health, which will be opened in the Spring of 1941.

As the first independent institution of its kind, the Cleveland Health Museum, incorporated as a non-profit institution in 1936, opened its doors November 12, 1940. It has the support of the Academy of Medicine and the Cleveland Dental Society. The organized dental profession has a representative on the board of trustees and on the advisory council. At the opening ceremonies of this Museum, J. V. Gentilly, First Vice President of the American Dental Association, said:

> As the representative of Dr. Wilfred H. Robinson, of Oakland, Calif., the President of the American Dental Association, I am delegated to extend greetings of the profession to those worthy persons of Cleveland who conceived this excellent Museum of Health; and to commend the members of the Cleveland Academy of Medicine for their persistency in promoting the establishment of this museum.
>
> Dentistry welcomes the opportunity of participating in these functions and willingly accepts its responsibility to support this form of health and hygiene education.

More than 6,000 square feet of exhibit space is available, dealing with human biology and questions of individual and public health. A special room has been set aside for dental health exhibits. The exhibits for this room are being planned in cooperation with the Bureau of Public Relations of the American Dental Association and other scientific institutions. Particular emphasis will be placed on the dental care of children, as experience has shown this to be one of the best means of interesting adults. More stress will be laid on the development of healthy teeth and their care, and the rôle they play in well-being, than on technicalities of dental diseases and dental defects.

The question of dental health will not be restricted to the dental health room, but will be taken up in regard to many other subjects, such as nutrition and prenatal care and as in the exhibit "Fitness for Defense."

The Cleveland Health Museum feels itself fortunate to have the dental and medical professions, working together under the same roof in promotion of the health of the entire community.

BRUNO GEBHARD, M. D., *Director.*

Cleveland is extremely fortunate in having secured a man of Dr. Gebhard's capabilities to direct its new Health Museum. Dr. Gebhard had his first experience in the broad field of health exhibits several years ago in Europe, where he was in charge of the laboratory that constructed the famous transparent man and woman. He has specialized in the art of translating scientific and technical information into language and displays understandable by the laity. Prior to coming to Cleveland, he created and managed the "Hall of Man" at the New York World's Fair.

PAUL J. AUFDERHEIDE.

GRANT TO PROMOTE RESEARCH AT NORTHWESTERN DENTAL SCHOOL

AN additional gift of $50,000 to Northwestern University by Alfred W. Bays and Henry B. Shattuck, trustees of the Clara A. Abbott estate, was announced December 7.

The money will be used for the study and treatment of harelip, cleft palate and similar facial or oral abnormalities, under the direction of Frederick W. Merrifield, of the Medical and Dental faculties.

The Abbott estate, established under the will of the widow of Wallace C. Abbott, founder of Abbott Laboratories, gave Northwestern University $1,665,000 earlier this year.

CONGRESS ON DENTAL EDUCATION

PLANS are going forward for the Congress on Dental Education and Licensure to be held under the auspices of the Council on Dental Education at the Stevens Hotel, Chicago, Saturday, February 15, 1941.

Reservations for the luncheon, to be held in the South Ball Room of the Stevens at 1 p.m., may be made by addressing Harlan H. Horner, secretary of the Council, 212 East Superior St., Chicago.

DR. DITTMAR TO BE HONORED

G. WALTER DITTMAR is to be honored by the University of Illinois College of Dentistry at a dinner in recognition of his service to dental education and the dental profession Saturday, February 15, at 8 p.m., at the Lake Shore Club of Chicago. There will be a reception for Dr. Dittmar at 7 p.m. to which his friends are invited. Reservations for the dinner can be made through John F. Kellogg, 808 South Wood St., Chicago, Ill.

TO OWNERS OF DENTAL LIBRARIES

THE November issue, volume 77 (1923), of the *Dental Register* (the last one published) was printed, but not distributed to the subscribers. There are probably a hundred dental libraries desirous of obtaining this issue and individuals have offered as much as $10 for a copy, but have been unable to secure one. In order to provide the dental libraries of the country with this missing issue, we propose to reprint and distribute it at cost with an index for the year.

In order to eliminate any suggestion of a profit motive, Northwestern University has been asked to handle the financial part of the project. Any one interested in obtaining the November 1923 issue of the *Dental Register* should address the Librarian, Northwestern University Dental School, 311 East Chicago Ave., Chicago, Ill., or Dr. Fred W. Gethro, 180 N. Michigan Ave., Chicago.

CORRESPONDENCE

AID IN IDENTIFICATION

To the Editor:

In the October 1939 issue of THE JOURNAL, you published the pictures and a notice relative to an unidentified body.

At the time, the only means of identification of this body was the dental work. Through publication of pictures in your magazine, identification was made November 7. Dr. Wilfred M. La Belle, 56 Suffolk Street, Holyoke, Mass., identified the lower anterior restoration as work that he did for a Mr. Romuald La Vallee approximately nineteen years ago.

After contacting Dr. La Belle, our inspector, Mr. Chameroy, identification officer, journeyed to Holyoke, Mass., with the dental work so that the doctor could make a thorough examination of the work itself. He positively identified it as his workmanship. We learned that Mr. La Vallee was reported missing from Holyoke, Mass., in March 1936. A widow and a daughter, living in Holyoke, were notified of the identification.

This should again prove to the dental profession and the public that identification is often possible from dental work.

Please accept our sincere thanks for your efforts in our behalf.

EDWARD J. HICKEY,
Commissioner of State Police,
State of Connecticut Department
of State Police, Hartford, Conn.

OBITUARIES

ALBERT HALLENBERG, D.D.S.

(1879-1940)

ALBERT HALLENBERG, D.D.S., one of the leading dentists and civic leaders of the northwest, active throughout his life in promoting dental society work, local, district, state and national, died at his home in Fargo, N. D., Sunday, November 17, from a heart attack. He suffered a stroke in July 1938, and had been in poor health since.

Albert Hallenberg was born in St. Paul, Minn., October 16, 1879. As a youth, he came to Fargo with his family. He attended the North Dakota Agricultural College and the University of Minnesota, and was graduated from the University of Pennsylvania School of Dentistry in 1900. In 1918, he did postgrad-

ALBERT HALLENBERG

uate work at the Royal College of Surgery, Toronto, Canada.

Dr. Hallenberg was chairman, for North Dakota, of the International Dental Congress in St. Louis in 1904; chairman for North Dakota of the Preparedness League of American Dentists during the first World War; a Past Vice President of the American Dental Association; a member of the American Academy of Restorative Dentistry; a Fellow of the American College of Dentists and of the International College of Dentists, and a past president of the North Dakota State Dental Association, the Fargo Dental Society and the Southeast District Dental Society.

In 1905, Dr. Hallenberg was instrumental in founding the Fargo District Dental Society, out of which grew the North Dakota Association, the following year.

He was a member of Xi Psi Phi (dental) and Delta Tau Delta fraternities. In 1935, he was responsible for the installation of a Delta Tau Delta chapter at the University of North Dakota.

From his first attendance at North Dakota Agricultural College, Dr. Hallenberg took a great interest in the welfare of that institution. He played football there in 1895 and 1896 and had been officially connected with the college as an alumnus member of the college athletic board for more than a quarter of a century. He also was interested and active in the affairs of the college Y.M.C.A., being chairman of its advisory board from 1928 to 1938 and later a trustee.

At its annual meeting in 1939 at Grand Forks, the North Dakota Dental Association honored Dr. Hallenberg with special recognition for his long service to the dental profession.

In addition to being a Past Vice President of the American Dental Association, he had served on many committees of that organization and attended most of its conventions since early in the century. He was a Trustee of the American Dental Association from the Eleventh District at the time of his death.

Dr. Hallenberg was a member and active in the affairs of Gethsemane Episcopal Cathedral in Fargo.

In 1903, he married Miss Pearl Childs of Chicago. Two children were born to them, Childs, a lieutenant in the Army, stationed at Fort Knox, Ky., and Charlotte, of New York, N. Y.

JAMES H. FULLENWIDER, D.D.S., F.A.C.D.
(1885-1940)

JAMES HERBERT FULLENWIDER, D.D.S., F.A.C.D., president of the Kentucky State Dental Association, died in Louis-

JAMES H. FULLENWIDER

ville, November 12, after an illness of four months.

He was born in Shelby County, Kentucky near Shelbyville, November 14, 1885, a direct descendant of the House of Orange, The Netherlands, his forbears having migrated to this country among the early colonists, settling here in 1739. He received his early education in a private Latin School and in the Shelbyville High School and was graduated from the

Louisville College of Dentistry in 1917. Immediately after graduation, he located in Louisville, where he practiced general dentistry until a few months before his death.

Dr. Fullenwider's interest in the affairs of organized dentistry dates back to the beginning years of his practice. He served on many committee assignments and in many official capacities in dental association work. He was a past president of the Louisville District Dental Society, and served as secretary-treasurer of the Kentucky State Dental Association from 1930 to 1939, when he became president-elect. In April 1940, he was installed as president of the state association, and he was serving in this capacity at the time of his death. He had served as a delegate to all sessions of the annual American Dental Association Meetings for about ten years. Under his secretaryship, the state association membership rose to an all-time mark of 550.

He was professor of dental economics at the University of Louisville; a member of the Delta Sigma Delta and Omicron Kappa Upsilon fraternities, and a Fellow in the American College of Dentists; a Mason, and a member of the Knights Templars and of the Methodist Church.

Surviving him are his sisters Mrs. Mary F. Callaway and Misses Estelle and Ada Fullenwider.

Dr. Fullenwider was of a quiet disposition and even temperament, and was a hard worker. These traits, with his sincerity of purpose, made him a man of great value to Kentucky dentistry and to the dental profession as a whole.

J. L. WALKER.

DEATHS

ALVORD, JOSEPH D., Bridgeport, Conn.; New York College of Dentistry, 1895; died recently.

BARRICK, WILLIAM J., Newark, Ohio; Ohio State University College of Dentistry, 1924; died July 11; aged 38.

BRENNAN, JOHN D., Shenandoah, Pa.; Philadelphia Dental College, 1897; died November 15; aged 70.

BRUBAKER, AUGUSTUS J., Philadelphia, Pa.; Philadelphia Dental College, 1903; died November 11; aged 56.

CHAPMAN, R. B., Pittsburgh, Pa.; University of Pittsburgh School of Dentistry, 1911; died September 13.

CROSS, FLOYD J., Wyoming, Pa.; University of Pennsylvania School of Dentistry, 1914; died September 22; aged 49.

DOUGHERTY, JOHN F., Canton, Ohio; Pennsylvania College of Dental Surgery, 1884; died October 2; aged 82.

ELLIS, GEORGE B., New York, N. Y.; New York College of Dentistry, 1916; died November 13.

HOUGHTON, HERBERT A., Willow Grove, Pa.; University of Pennsylvania School of Dentistry, 1899; died recently; aged 62.

HUIE, FRED LYNN, Vidalia, Ga.; Southern Dental College, 1907; died September 9; aged 56.

KENNEDY, SANFORD M., Tarentum, Pa.; Indiana University School of Dentistry, 1883; died July 2; aged 85.

KLIAUGA, CASIMIR K., Chicago, Ill.; Northwestern University Dental School, 1919; died November 6; aged 57.

KOLES, GEORGE W., New York, N. Y.; New York University College of Dentistry, 1892; died September 30.

KUEBLER, HERMAN C., Toledo, Ohio; University of Michigan School of Dentistry, 1885; died August 4; aged 78.

KUHLMANN, WILLIAM H., Harrison, Ohio; Ohio College of Dental Surgery, 1902; died October 1; aged 61.

LEWIS, EDWARD H., Dayton, Ohio; Northwestern University Dental School, 1935; died September 21; aged 45.

MICHLIN, SAMUEL G., New York, N. Y.; New York University College of Dentistry, 1907; died October 31.

MORRIS, W. J., Scranton, Pa.; Medico-Chirurgical College of Philadelphia, 1914; died June 3.

DIRECTORY OF STATE SOCIETY OFFICERS AND DATES OF MEETINGS, 1940-1941

ALABAMA DENTAL ASSOCIATION

Hunter S. Allen, President.....Comer Bldg., Birmingham
Claude C. Cannon, President Elect.....Fayette
George W. Matthews, Secretary-Treasurer..905 Protective Life Bldg., Birmingham
Next annual meeting: Tutwiler Hotel, Birmingham, April 8-10, 1941.

ARIZONA STATE DENTAL SOCIETY

W. R. Pinkerton, President.....Legett Bldg., Douglas
George H. Chiles, President Elect.....618 Professional Bldg., Phoenix
Melvin Saxman, Secretary-Treasurer.....919 Professional Bldg., Phoenix
Next annual meeting: Phoenix.

ARKANSAS STATE DENTAL ASSOCIATION

H. J. Green, President.....Paragould
J. H. Flanagin, President Elect.....Conway
I. M. Sternberg, Secretary-Treasurer.....Fort Smith
Next annual meeting: Fort Smith, May 19-21, 1941.

SOUTHERN CALIFORNIA STATE DENTAL ASSOCIATION

Guy Van Buskirk, President.....1930 Wilshire Blvd., Los Angeles
John F. Steen, President Elect.....Bank of America Bldg., San Diego
Francis J. Conley, Secretary.....804 Professional Bldg., Los Angeles
Harry H. Bleecker, Treasurer.....919 Roosevelt Bldg., Los Angeles
Next annual meeting: Los Angeles, September 8-11, 1941.

CALIFORNIA STATE DENTAL ASSOCIATION

Robert F. Thayer, President.....1736 Franklin St., Oakland
Charles F. Gray, President Elect.....Medico-Dental Bldg., Sacramento
Frederick T. West, Secretary.....2180 Washington St., San Francisco
John W. Hagan, Treasurer.....1505 Webster St., Alameda
Next annual meeting: Fairmont Hotel, San Francisco, April 21-23, 1941.

COLORADO STATE DENTAL ASSOCIATION

C. J. Brown, President.....McNeen Block, La Junta
C. F. Brown, President Elect.....Mack Bldg., Denver
C. K. Phillips, Secretary.....529 Majestic Bldg., Denver
C. H. Watson, Treasurer.....500 Metropolitan Bldg., Denver
Next annual meeting: Colorado Springs, June 19-21, 1941.

CONNECTICUT STATE DENTAL ASSOCIATION

Gilbert Kilduff, President.....111 W. Main St., Waterbury
Henry Hicks, President Elect.....5 Glen Court, Greenwich
C. W. Vivian, Secretary-Treasurer.....58 Elbridge Rd., New Britain
Next annual meeting: Stratfield Hotel, Bridgeport, April 30-May 2, 1941.

DELAWARE STATE DENTAL SOCIETY

Russell J. Emery, President.....Harrington
A. Goberman, Vice President.....4th and Market Sts., Wilmington
James A. Bounds, Secretary.....Laurel
Frank M. Hoopes, Treasurer.....906 Jefferson St., Wilmington

DISTRICT OF COLUMBIA DENTAL SOCIETY

Daniel F. Lynch, President..1149 16th St., N. W., Washington, D. C.
David J. Fitzgibbon, President Elect...1801 Eye St., N. W., Washington, D. C.
J. Walter Bernhard, Secretary-Treasurer...1835 Eye St., N. W., Washington, D. C.
Next annual meeting: Mayflower Hotel, Washington, March 9-13, 1941.

FLORIDA STATE DENTAL SOCIETY

I. W. Shields, President.....511 Huntington Bldg., Miami

Lloyd N. Harlow, President Elect.....
.....State Board of Health, Jacksonville
William P. Wood, Jr., Secretary-Treasurer..
.....442 W. Lafayette St., Tampa
Next annual meeting: Hollywood.

GEORGIA DENTAL ASSOCIATION

Semon Eisenberg, President.....
.....302 Bull St., Savannah
C. A. Yarbrough, President Elect.....
.....Bibb Bldg., Macon
R. H. Murphy, Secretary.....
.....Georgia Casualty Bldg., Macon
Frank Tillery, Treasurer.....Columbus
Next annual meeting: Hotel Desoto, Savannah, May 19-21, 1941.

HAWAII TERRITORIAL DENTAL SOCIETY

F. M. Branch, President.....
.....305 Boston Bldg., Honolulu
Masao Kubo, President Elect.....
.....P.O. Box 1166, Hilo
John H. Dawe, Secretary.....
.....P.O. Box 39, Honolulu
F. S. Kagihara, Treasurer.....
.....1476 S. King St., Honolulu
Next annual meeting: Honolulu, T. H., September 1941.

IDAHO STATE DENTAL ASSOCIATION

P. G. Flack, President.....
.....417 First Nat'l Bank Bldg., Boise
S. W. Siljan, President Elect.....
.....Barnard Bldg., Wallace
W. B. Hoarty, Secretary.....
.....614 Eastman Bldg., Boise
E. B. Carpenter, Treasurer.....
.....200 Eastman Bldg., Boise
Next annual meeting: Sun Valley, June 1941.

ILLINOIS STATE DENTAL SOCIETY

John J. Donelan, President.....
...United Mine Workers Bldg., Springfield
J. R. Blayney, President Elect.....
.....950 E. 59th St., Chicago
L. H. Jacob, Secretary.....
.....634 Jefferson Bldg., Peoria
R. W. McNulty, Treasurer.....
.....1757 W. Harrison St., Chicago
Next annual meeting: Peoria, Ill., May 12-15, 1941.

INDIANA STATE DENTAL ASSOCIATION

B. K. Westfall, President.....
....1006 Hume-Mansur Bldg., Indianapolis
R. N. Douglas, President Elect.....
.....506½ S. Second St., Elkhart
E. E. Ewbank, Secretary.....Kingman
William Bogie, Treasurer.....
.....214 Main St., Vincennes
Next annual meeting: Claypool Hotel, Indianapolis, May 19-21, 1941.

IOWA STATE DENTAL SOCIETY

C. T. Brann, President.....
....1000 First Nat'l Bank Bldg., Davenport
Hardy Pool, President Elect.....
.....Foresters Bldg., Mason City
C. S. Foster, Secretary.....
.....803 Dows Bldg., Cedar Rapids
L. C. Dow, Treasurer.....Marion
Next annual meeting: Des Moines, May 5-7, 1941.

KANSAS STATE DENTAL ASSOCIATION

John E. Morgan, President.....Emporia
E. L. Hodge, President Elect.....McPherson
Fred A. Richmond, Secretary.....
.....1008 Huron Bldg., Kansas City
S. H. Flickinger, Treasurer.....Baldwin
Next annual meeting: Topeka, April 27-30, 1941.

KENTUCKY STATE DENTAL ASSOCIATION

Leo S. Johnston, President.....
.....2900 Frankfort Ave., Louisville
Robert R. Linville, President Elect.....
.....Mount Olivet
J. L. Walker, Secretary-Treasurer.....
.....640 Barbee Way South, Louisville
Next annual meeting: Brown Hotel, Louisville, April 7-9, 1941.

LOUISIANA STATE DENTAL SOCIETY

Samuel D. Gore, President.....
..1237 Maison Blanche Bldg., New Orleans
S. B. Robinson, President Elect.....
.....604 Weber Bldg., Lake Charles
Julian S. Bernhard, Secretary.....
.....419 Medical Arts Bldg., Shreveport
Oscar J. Ory, Treasurer.....Garyville
Next annual meeting: Roosevelt Hotel, New Orleans, May 1-3, 1941.

MAINE DENTAL SOCIETY

Alvah C. Thompson, President.....
.....11 Deering St., Portland
Edward W. Peaslee, President Elect.....
.....184 Water St., Augusta
Philip W. Woods, Secretary.....
.....State Department of Health, Augusta
Henry H. Grant, Treasurer.....
.....655 Congress St., Portland
Next annual meeting: Portland, June 26-28, 1941.

MARYLAND STATE DENTAL ASSOCIATION

Harry B. McCarthy, President.....42 S. Green St., Baltimore
William E. Trail, President Elect.....Frederick
Meyer Eggnatz, Secretary.....Medical Arts Bldg., Baltimore
J. M. Hyson, Treasurer.....2128 St. Paul St., Baltimore
Next annual meeting: Baltimore, May 5-6, 1941.

MASSACHUSETTS DENTAL SOCIETY

George Cowles Brown, President.....332 Main St., Worcester
Maurice E. Peters, President Elect.....60 Charlesgate West, Boston
Philip E. Adams, Secretary.....160 Marlborough St., Boston
Glenn W. Lawrence, Treasurer.....412 Beacon St., Boston
Next annual meeting: Hotel Statler, Boston, April 14-17, 1941.

MICHIGAN STATE DENTAL SOCIETY

F. J. Henry, President.....1170 Madison Ave., S. E., Grand Rapids
C. J. Wright, President Elect.....703 American State Bank Bldg., Lansing
William R. Davis, Secretary.....Michigan Dept. of Health, Lansing
H. C. Gerber, Jr., Executive Secretary.....1514 Olds Tower, Lansing
E. J. Chamberlin, Treasurer.....520 Ashton Bldg., Grand Rapids
Next annual meeting: Detroit, April 21-23, 1941.

MINNESOTA STATE DENTAL ASSOCIATION

Thomas P. Ryan, President.....949 Medical Arts Bldg., Minneapolis
O. J. Merwin, President Elect.....478 S. Snelling Ave., St. Paul
L. M. Cruttenden, Secretary.....498 Lowry Bldg., St. Paul
A. R. Schmid, Treasurer.....Worthington
Next annual meeting: Municipal Auditorium, Minneapolis, February 25-27, 1941.

MISSISSIPPI DENTAL ASSOCIATION

F. C. Williams, Jr., President.....Corinth
J. C. Luper, President Elect.....Okolona
George P. Evans, Secretary-Treasurer.....Jackson
Next annual meeting: Biloxi, June 9-11, 1940.

MISSOURI STATE DENTAL ASSOCIATION

William A. Haas, President.....Tootle Bldg., St. Joseph
O. A. Kelly, President Elect.....297 University Club Bldg., St. Louis
C. W. Digges, Secretary-Treasurer..Columbia
Next annual meeting: St. Joseph, May 4-7, 1941.

MONTANA STATE DENTAL ASSOCIATION

W. W. Cloyd, President.....Livingston
F. W. Adams, President Elect.....Billings
T. T. Rider, Secretary-Treasurer.....9 Higgins Block, Missoula
Next annual meeting: Missoula, May 1-3, 1941.

NEBRASKA STATE DENTAL ASSOCIATION

H. E. Snyder, President.....Columbus
C. H. Schroeder, President Elect.....Medical Arts Bldg., Omaha
F. A. Pierson, Secretary.....1112 Federal Securities Bldg., Lincoln
C. A. Bumstead, Treasurer.....Stuart Bldg., Lincoln
Next annual meeting: Omaha, May 12-14, 1941.

NEVADA STATE DENTAL ASSOCIATION

G. C. Steinmiller, President.....Reno
O. M. Seifert, President Elect.....Reno
L. M. Nelson, Secretary-Treasurer.....Reno
Next annual meeting: Reno, June 7, 1941.

NEW HAMPSHIRE DENTAL SOCIETY

William H. Putney, President.....85 Pleasant St., Concord
Robert N. Sawyer, President Elect.....Franklin
Floyd E. Williams, Secretary.....814 Elm St., Manchester
William H. Young, Treasurer.....40 N. Main St., Concord

NEW JERSEY STATE DENTAL SOCIETY

Frank J. Houghton, President.....50 Glenwood Ave., Jersey City
William D. Hinman, President Elect.....1105 Salem Ave., Hillside
F. K. Heazelton, Secretary.....223 E. Hanover St., Trenton
Charles P. Crowe, Treasurer.....521 Main St., East Orange
Next annual meeting: Asbury Park, May 7-9, 1941.

NEW MEXICO STATE DENTAL SOCIETY

Fred Muller, President.....Taos
Harry Bryant, President Elect.....
.....1st Nat'l Bank Bldg., Albuquerque
J. S. Eilar, Secretary-Treasurer.....
.....1st Nat'l Bank Bldg., Albuquerque
Next annual meeting: Albuquerque, June 1941.

DENTAL SOCIETY OF THE STATE OF NEW YORK

W. Ray Montgomery, President.....
.....675 Delaware Ave., Buffalo
John H. Carter, President Elect.....
.....143 Mohawk St., Cohoes
James T. Ivory, Vice President.....
...612 Security Mutual Bldg., Binghamton
Charles A. Wilkie, Secretary.....
.....1 Hanson Place, Brooklyn
George D. Greenwood, Treasurer.....
.....1172 Mercantile Bldg., Rochester
Next annual meeting: Hotel Statler, Buffalo, May 12-16, 1941.

NORTH CAROLINA DENTAL SOCIETY

C. M. Parks, President.....Winston-Salem
C. C. Poindexter, President Elect.....
.....Greensboro
Paul Fitzgerald, Secretary-Treasurer.....
.....Greenville
Next annual meeting: Carolina Hotel, Pinehurst, May 12-14, 1941.

NORTH DAKOTA STATE DENTAL ASSOCIATION

Victor B. Abbott, President.....Minot
L. E. Musberger, President Elect...Jamestown
W. D. Toepke, Secretary.....New Salem
H. J. Weir, Treasurer.....Dickinson
Next annual meeting: Fargo, May 12-14, 1941.

OHIO STATE DENTAL SOCIETY

William H. Wolford, President.....
.....708 Farmers Bank Bldg., Mansfield
Edward L. Ball, President Elect.....
.....814 Doctors Bldg., Cincinnati
Edward C. Mills, Secretary.....
.....255 E. Broad St., Columbus
Robert M. Appleman, Treasurer.....
.....40 S. 3rd St., Columbus
Next annual meeting: Columbus, November 1941.

OKLAHOMA STATE DENTAL SOCIETY

Harry H. Sorrels, President.....
..1003 Medical Arts Bldg., Oklahoma City
Scott P. Bowyer, President Elect.....
.....716 Medical Arts Bldg., Tulsa
O. W. Boyer, Secretary.....Perry
W. C. Travis, Treasurer.....Chickasha
Next annual meeting: Skirvin Hotel, Oklahoma City, April 27-30, 1941.

OREGON STATE DENTAL ASSOCIATION

S. C. Robinson, President.....
.....Selling Bldg., Portland
N. L. Zimmerman, President Elect.....
.....Medical-Dental Bldg., Portland
F. W. Hollister, Secretary-Treasurer.....
.....Selling Bldg., Portland
Next annual meeting: Portland.

PANAMA CANAL ZONE DENTAL SOCIETY

Gerald J. Gabriel, President.....
.....Gorgas Hospital, Ancon
A. DeCastro, Vice President....Panama City
Oscar J. Ogren, Secretary-Treasurer.....
.....Fort Clayton
Next annual meeting: Panama City, April 1941.

PENNSYLVANIA STATE DENTAL SOCIETY

W. J. Robinson, President.....
.....4906 Walnut St., Philadelphia
Boyd A. Lowry, President Elect.....
.....First Nat'l Bank Bldg., Williamsport
John B. Price, Secretary.....
.....6013 Greene St., Philadelphia
C. J. Hollister, Executive Secretary.....
.....217 State St., Harrisburg
Wayde D. Kelly, Treasurer.....
.....Payne-Shoemaker Bldg., Harrisburg
Next annual meeting: Bedford Springs Hotel, Bedford, June 3-5, 1941.

NATIONAL DENTAL SOCIETY OF THE PHILIPPINE ISLANDS

Joaquin Ladao, President.....
.....208 Kneedler Bldg., Manila
Gil Montinela, Vice President.....Manila
Faustino F. Turla, Secretary-Treasurer....
.....777 Legarda St., Manila

DENTAL ASSOCIATION OF PUERTO RICO

Jose Vicente, President...Box 1448, San Juan
Juan Font Suarez, Secretary.....
.....Box 3863, Santurce
L. Ramirez Santi Banez, Treasurer.....
.....San Justo St., San Juan

RHODE ISLAND STATE DENTAL SOCIETY

Edwin K. Devine, President.....
.....708 Union Trust Bldg., Providence
Thomas W. Clune, President Elect.....
.....1282 Cranston St., Cranston

Maurice A. Dewby, Vice President.....
.....7 Washington, Warren
Michael B. Messore, Secretary.....
.....100 Washington St., Providence
Arthur M. Dring, Treasurer.....
.....166 Thomas St., Newport
Next annual meeting: Biltmore Hotel, Providence, January 15-16, 1941.

SOUTH CAROLINA STATE DENTAL ASSOCIATION

E. G. Bumgardner, President.....Columbia
E. P. Durant, President Elect.....Sumter
P. B. Hair, Secretary-Treasurer..Spartanburg
Next annual meeting: Columbia, May 1941.

SOUTH DAKOTA STATE DENTAL SOCIETY

J. W. King, President.....Aberdeen
W. P. Henderson, President Elect..Sioux Falls
Ernest W. Elmen, Secretary.....Sioux Falls
W. H. Morgans, Treasurer.....Aberdeen
Next annual meeting: Rapid City, June 15-17, 1941.

TENNESSEE STATE DENTAL ASSOCIATION

J. Guilford Sharp, President.....
.....604 Medical Arts Bldg., Knoxville
R. H. Blane, President Elect.....
..818 Chattanooga Bank Bldg., Chattanooga
Howard M. Taylor, Secretary-Treasurer...
.....202 Medical Arts Bldg., Knoxville
Next annual meeting: Andrew Johnson Hotel, Knoxville, May 12-15, 1941.

TEXAS STATE DENTAL SOCIETY

Monte R. Garrison, President.....
.....Hamilton Bldg., Wichita Falls
Lloyd A. Crabb, President Elect.....
.....Medical Arts Bldg., Dallas
Willard Ogle, Secretary-Treasurer.....
.....Medical Arts Bldg., Dallas
Next annual meeting: Dallas, April 20, 1941.

UTAH STATE DENTAL ASSOCIATION

K. W. Merrill, President.....
....507 Medical Arts Bldg., Salt Lake City
L. O. Halgren, President Elect.....
.....First Nat'l Bank Bldg., Salt Lake City
D. I. Folsom, Secretary-Treasurer.....
..1101 First Nat'l Bk. Bldg., Salt Lake City
Next annual meeting: Hotel Utah, Salt Lake City, June 26-28, 1941.

VERMONT STATE DENTAL SOCIETY

Harold E. Spear, President.....Swanton
Howard H. Reid, Secretary.....Barre
Howard F. Killary, Treasurer.....Burlington

VIRGINIA STATE DENTAL ASSOCIATION

M. S. Jenkins, President.....
.....Medical Arts Bldg., Roanoke
Dan O. Via, President Elect...Charlottesville
J. E. John, Secretary-Treasurer.....
.....Medical Arts Bldg., Roanoke
Next annual meeting: Old Point Comfort, May 8-10, 1941.

WASHINGTON STATE DENTAL ASSOCIATION

L. W. Zech, President.....
.....503 Medical & Dental Bldg., Seattle
C. T. Fleetwood, President Elect.....
.....1015 Medical & Dental Bldg., Seattle
A. W. Jeffery, Secretary-Treasurer.....
.....533 Medical & Dental Bldg., Seattle
Next annual meeting: Portland, July 1941.

WEST VIRGINIA STATE DENTAL SOCIETY

N. H. Baker, President.....Charleston
H. A. Erwin, President Elect.....Hurricane
C. G. Anderson, Secretary.....Mount Hope
John S. Stone, Treasurer.....Clarksburg
Next annual meeting: White Sulphur Springs, May 19-21, 1941.

WISCONSIN STATE DENTAL SOCIETY

E. H. Redeman, President.....Marinette
C. J. Baumann, President Elect.....
.....408 W. Greenfield Ave., Milwaukee
Miss Ruth A. Kroger, Secretary.....
.....1233 Bankers Bldg., Milwaukee
C. P. Collins, Treasurer.....
.....625 57th St., Kenosha
Next annual meeting: Schroeder Hotel, Milwaukee, April 24-27, 1941.

WYOMING STATE DENTAL ASSOCIATION

P. J. Kane, President.....Sheridan
R. J. Stapleton, President Elect...Green River
J. D. McNiff, Secretary-Treasurer....Laramie
Next annual meeting: Cody, June 1941.

CURRENT LITERATURE

Treatment of Cancer of the Lip and Mouth

By George E. Pfahler

The greatest factor in the prevention of cancer in the mouth is the skilful and thorough treatment of lesions which precede cancer. More progress can be made in treating the disease by this method than by searching for some specific cure. Abnormal swellings, fever blisters and other lesions are often of a predisposing nature. Very few, if any, cases begin as true cancer.

Cancer of the mouth is always a serious problem because metastasis is likely to occur, especially when the tongue is involved. The continual movement of the tongue in speaking, swallowing or chewing, together with the rich distribution of lymphatics, makes the likelihood of extension of the disease very great.

Electrosurgery and irradiation are the preferred methods of treatment of cancer of the lips and mouth. Irradiation is better because it prevents spread of the disease. The author obtained 98 per cent five-year cures in lesions up to 1.5 cm. in diameter; 68 per cent in larger ones, and 48 per cent in those with palpable lymph nodes.—*Radiology,* 35: 598, November 1940.

Victor De Frank.

A Study of Tooth Eruption in 856 Female Patients at Letchworth Village

By Bennet M. Lathrop

The possible correlation between dentition and intelligence has frequently been discussed. An attempt is made in this paper to analyze 856 female patients at Letchworth Village and make an approach to the subject of eruption of the permanent teeth. No account is taken of clinical types, general physical development, race or dietary factors. The patients range in age from 5 years 9 months to 18 years 9 months. The age of the patient is computed to the day and the patients are divided into age groups. The I. Q. range is from 5 to 87.

A summary of the analysis shows that the eruption time is consistently lower for those mentally deficient, the delay being quite consistent for every tooth. Some of the delay may be attributed to the inclusion of Mongolian idiots and cretins, who are known to have markedly delayed eruption.—*Proc. Am. A. Ment. Deficiency,* 63:49, 1939.

Virgil D. Cheyne.

Traumatic Changes in the Periodontal Tissues of Deciduous Teeth

By Rudolf Kronfeld and Josef Weinmann

In a histologic study of the deciduous dentitions of six infants in a chronologic series from 9 months to 4½ years of age, there was evidence of traumatic change. The injuries from compression ranged in severity from ischemia and mild hyalinization of the periodontal membrane, with evidence of resorption and rebuilding of bone and cementum, to localized necrosis and hemorrhage. It is assumed that there had been unequal masticatory strain on incompletely erupted teeth in the younger cases, but, in the older jaws, normal occlusion existed in all cases. In the oldest one studied, some of the changes were due to the normal phenomena of shedding.

The authors believe that the injuries were due to the weakness of the periodontal tissues of erupting or newly erupted teeth, not yet fully equipped to withstand full masticatory stress. They believe that traumatized teeth at this stage may become sore and slightly loose and a temporary shift in mastication may result, causing ankylosis or separative phenomena in the tissues.—*J. D. Res.,* 19:441, October 1940.

Hannah E. Silberstein.

Dendritic Cells in the Alveolar Gingiva and Enamel Epithelium; Destruction of the Enamel Epithelium by Phagocytic Cells

By Milton Berman

The author reports some of the findings at necropsy on an 11-months-old child. The

history revealed several disorders, including congenital osteosclerosis with secondary anemia, chronic splenic tumor, congenital heart disease, weight loss and failure of tooth eruption. Histologic studies were made of the tooth germs and the gingiva. Sections stained with hematoxylin and eosin showed poor calcification of the teeth, but apparently normal gum tissue. The use of Bodian's silver stain for nerve tissue, however, revealed numerous dendritic cells scattered throughout the gingival epithelium. A few were found in the basal layer as well as in the reduced enamel epithelium. They had the dopa reaction and resembled skin melanoblasts.

The gingivae of ten light-skinned and ten Negro subjects were likwise examined and similar cells found, but they were fewer and of a different appearance microscopically.

The author suggests a possible correlation between dendritic cells and blood dyscrasia, as well as melanotic tumors. A more widespread use of special stains in the study of the dental tissues is recommended.—*J. D. Res.*, 19:497, October 1940.

HANNAH E. SILBERSTEIN.

Effect of Oxidizing Agents on Certain Non-Spore Forming Anaerobes

By HOMES T. KNIGHTON

OXIDIZING agents are commonly used in the treatment of infections due to anaerobic organisms. The usual reason advanced for this procedure is that anaerobes are intolerant of the liberated oxygen. The author has questioned the validity of the assumption, however. Experiments were designed, therefore, to (1) compare the immediate germicidal effect of oxidizing agents on obligate anaerobes with the germicidal effect of the more commonly used chemicals; (2) compare the germicidal effect of oxidizing agents on anaerobes with their effect on common aerobes, (3) compare the germicidal effect of oxidizing agents and other chemicals on anaerobes in the presence of blood and (4) test the protective effect of blood on anaerobes exposed to atmospheric oxygen.

The conclusions are that hydrogen peroxide, as such, is far more bactericidal for anaerobes than is the oxygen liberated. The activity of sodium perborate is also probably due to other conditions, all of which may also exert a deleterious effect on the tissues. Zinc peroxide offers the most promising results as a prolonged oxidizing agent, but there is difficulty in keeping it in contact with oral tissues. There is no reason to assume that anaerobes are any less susceptible to the germicidal action of commonly used chemicals than are aerobes. The only logical reason for using certain oxidizing agents is the mechanical cleansing effect, or a need for long continued use of a relatively non-toxic substance.—*J. D. Res.*, 19:429, October 1940.

VIRGIL D. CHEYNE.

Treatment of Cervical Nodes in Intra-Oral Cancer

By JAMES J. DUFFY

THE author approaches the problem from a surgical point of view, outlining the criteria upon which his method of treatment is based. If the treatment is to be surgical, only a radical neck dissection is advocated. If surgery is contra-indicated, irradiation is advised, except in the most advanced cases, in which treatment by surgery or irradiation should not be undertaken. Criteria are given for the procedure of treatment by surgery or irradiation of the cervical region in cases of intra-oral carcinoma, and all the manifestations, from the type and extent of the primary lesion to the general condition of the patient. It is suggested that these criteria are applicable for clinics in which competent surgical work is done, and in which there are competent radiologists with adequate irradiation facilities.—*Surg., Gynec. & Obst.*, 70:664, November 1940.

JAMES T. GINN.

Interrelationship of Deficiency Diseases and Resistance to Infection

By J. W. RIDDLE, TOM D. SPIES and V. P. HUDSON

STUDIES of 150 selected cases of clinical pellagra, riboflavin deficiency and beriberi, along with associated deficiencies, disclosed that a relationship exists between such deficiencies and infections with certan spirochetes and hemolytic organisms. In addition to masses of Vincent's organisms, 64 per cent of cases of ulceration of the tongue, gums or buccal mucosa yielded *Streptococcus hemolyticus*, and the remainder hemolytic strains of *Staphylococcus aureus*. Specific antipellagric therapy caused disappearance

of the bacterial flora of these ulcerations, including the spirochetes.—*Proc. Soc. Exper. Biol. & Med.*, 45:361, October 1940.

H. B. McCAULEY.

Distribution of Ingested Phosphorus in the Bones and Teeth of a Dog, Shown by Radioactive Isotope

By MARIAN LEFEVRE MANLY, H. C. HODGE and S. N. VANVOORHIS

A DOG was fed radioactive phosphorus in the form of sodium phosphate in four equal doses on two successive days. Twelve days after the last dose, the dog was killed; bone samples were taken, the teeth removed and the enamel and dentin separated, and the organic material was extracted. The phosphorus in the various samples was measured by a Geiger-Müller counter.

The uptake of phosphorus was greater in spongy than in dense diaphyseal bone. In the dentin, the uptake was relatively constant throughout, and of the same order of magnitude as in dense bone. In the enamel, only negligible traces were observed.—*Proc. Soc. Exper. Biol & Med.*, 45:70, October 1940.

H. B. McCAULEY.

Use of Thorium Dioxide in Roentgenography of the Sinuses

By R. CLARK GROVE and ROBERT A. COOKE

A 25 per cent colloidal solution of thorium dioxide diluted in one or two parts of distilled water is an ideal contrast medium to demonstrate pathologic changes in the sinus membranes. Its roentgenographic use is based on the fact that the preparation is flocculated as a surface coating. It is preferable to iodized oil because of its lesser density and the fact that its use is unlikely to have an allergic reaction. It is especially useful in cases of polypoid degeneration or hyperplastic sinusitis wherein the antrum may be transilluminated clearly with no evidence of pus or of polyps in the nose.—*Am. J. Roentgenol.*, 44:680, November 1940.

H. B. McCAULEY.

Occurrence of Complications of the Nervous System Following the Extraction of Teeth

By BERNARD J. ALPERS

IN this article, the fact that the removal of diseased teeth is not without danger is stressed. Three cases of neurologic complications following the extraction of teeth are reported. A survey of previously reported cases shows that many types of neurologic disorders may follow the extraction of teeth.—*J. Nerv. & Ment. Dis.*, 92:752, December 1940.

E. C. WOODS.

Heterotopische Produktion von Knochengemehe Vermittels Transplantation von Zahnpulpa (Heterotopic Production of Bone Tissue by Transplantation of the Dental Pulp)

By S. PALAZZI and G. R. BUGLIARI

THE authors first consider how other workers have obtained bone formation from various tissue transplants. By transplantation of dental pulp tissue, they observed in x-ray films and histologic sections that bone formation occurred after a short time and in fairly large quantities within twelve days.—*Ztschr. f. Stomatol.*, 38:634, September 1940.

R. F. SOGNNAES.

A New Nitrous Oxide Technique for Dental Surgery in Diabetes Mellitus

By SAMUEL BLAUSTEIN

FROM a study of nitrous oxide anesthesia in diabetic patients, it was found that the best results were obtained when the patients took from one-fourth to one-half their regular number of units of insulin before operation, the remaining number of units being taken ten minutes after return to consciousness. All operations were performed with the stomach empty.—*Cur. Res. Anes. & Analg.*, 19:345, November-December 1940.

E. C. WOODS.

Did Dentistry Evolve from the Barbers or the Blacksmiths, or from Medicine?

By BERNHARD W. WEINBERGER

THE history of medicine and that of dentistry are so interwoven that it is impossible from the preserved records to distinguish them in ancient times. Egypt was the medical center of the ancient world. From ancient records, it is believed that dentistry preceded medicine in Tuscany and Rome. From 3,000 B.C. to the sixteenth century, dentistry was a specialized part of medicine, and its highest development appears to have been about the tenth century B.C. Before that time, it is believed that dentistry was practiced by a specialized group. The author

concludes that there is no evidence in any period of dental history that barbers were dentists or that they contributed anything to the progress of dentistry. He found, in examining the records, that dentistry did not "evolve from the barbers, the blacksmiths or perhaps even from medicine."—*Bull. Hist. Med.*, 8:965, July 1940.

JAMES T. GINN.

Osteomalacia and Dental Caries

By G. F. TAYLOR and C. D. MARSHALL DAY

IN a district of Punjab, India, the authors found that twenty-two women with osteomalacia had well preserved teeth; i.e., only 1.54 cavities per individual. The observation indicates that the disturbances affecting the bone structure had no apparent effect on the susceptibility to dental caries under these given conditions.—*Brit. D. J.*, 69:316, November 1940.

R. F. SOGNNAES.

Comparative Study of Anaerobic Strains of Actinomyces from Clinically Normal Mouths and from Actinomycotic Lesions

By H. R. SULLIVAN and N. E. GOLDSWORTHY

OBSERVATIONS of these studies seem to indicate that *Actinomyces bovis* is present in the mouth normally, and, when favorable conditions arise, it invades tissue and disease results. Several strains have been isolated from carious teeth, periodontal pockets and lesions near the angle of the jaw, the two former being from patients not suffering from obvious clinical actinomycosis.—*J. Path. & Bact.*, 51:253, September 1940.

A. PEARSON.

Acute Infections of the Jaw

By CARROLL W. STUART

THE author states that of the four chief modes of entry of bacteria into the jaw, entrance is predominantly from within, either from an infected pocket or from the pulp.—*D. J. Australia*, 12:622, October 1940.

A. PEARSON.

Affections of the Accessory Sinuses

By E. D. RICHARDS

EXPERIMENTALLY, there appears to be evidence that regeneration follows injection or removal of the epithelial lining of sinuses by operation. This is contrary to recent views. Inasmuch as the fundamental causes of the condition are not definitely understood, treatment will, in general, be symptomatic.—*D. J. Australia*, 12:600, October 1940.

A. PEARSON.

Value of Intraoral Radiographs in Diagnosis; Their Use and Abuse

By RUSSELL W. FORCE

UNCHECKED dental caries often results in progressive bacterial invasion through the blood and lymph vessels, lowering the resistance of the various organs and tissues of the body. Many degenerative diseases owe their inception to primary focal infections of such origin. Comprehensive pictures of existing oral conditions are essential, but some dentists are contented with negative findings from x-ray examination of the teeth and surrounding structures.

Four types of examination should be made, each one being checked with the other three, as each is incomplete in itself: (1) the clinical examination; (2) the roentgenographic examination; (3) transillumination, and (4) the electric pulp-test for vitality. By careful observation, the early stages of many general disorders can also be detected in the mouth.

Having in mind the importance of differentiating normal landmarks from pathologic areas, the author outlines the normal and abnormal radiolucent and radiopaque areas usually encountered. The paper is a résumé of the more common physiologic and pathologic conditions as found in intra-oral roentgenograms.—*Mil. Surgeon*, 87:429, November 1940.

J. F. STRIEGEL.

Cotton Sutures—Use in General Surgery

By J. B. SOGUE and W. E. WALSH

SPOOL cotton was used by the authors as a suture material in 172 general surgical cases. It was found to cause minimal irritation and its use resulted in dry handling. Cotton suture material is easily sterilized. It is definitely more difficult to handle than catgut, but seems to assure a more rapid and satisfactory healing of wounds.—*U. S. Navy Med. Bull.*, 38:511, October 1940.

W. F. KOSS.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

AMERICAN ASSOCIATION OF ORTHODONTISTS, New York, N. Y., May 5-8.

AMERICAN PUBLIC HEALTH ASSOCIATON, Atlantic City, N. J., October 14-17.

CHICAGO DENTAL SOCIETY, MIDWINTER MEETING, February 17-20.

DALLAS MIDWINTER DENTAL CLINIC, Dallas, Texas, April 21-23.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second and fourth Tuesdays in each month from October to June at the United States Public Health Service Auditorium, Washington.

FIVE STATE POST GRADUATE CLINIC, Washington, D. C., March 9-13.

GREATER PHILADELPHIA ANNUAL MEETING, February 4-7.

ILLINOIS STATE ORAL HYGIENISTS' ASSOCIATION, Chicago, Ill., February 17-20.

PACIFIC COAST SOCIETY OF ORTHODONTISTS, San Francisco, Calif., February 20-22.

SOUTHWESTERN SOCIETY OF ORTHODONTISTS, Lubbock, Texas, February 2-5.

WASHINGTON UNIVERSITY SCHOOL OF DENTISTRY SEVENTY-FIFTH ANNIVERSARY, St. Louis, Mo., April 7-12.

STATE SOCIETIES

January

Rhode Island, at Providence (15-16)

February

Minnesota, at Minneapolis (25-27)

March

District of Columbia, at Washington (9-13)

April

Alabama, at Birmingham (8-10)
California, at San Francisco (21-23)
Connecticut, at Bridgeport (30-May 2)
Kansas, at Topeka (27-30)
Kentucky, at Louisville (7-9)
Massachusetts, at Boston (14-17)
Michigan, at Detroit (21-23)
Oklahoma, at Oklahoma City (27-30)
Panama, at Panama City
Texas, at Dallas (20)
Wisconsin, at Milwaukee (24-27)

May

Arkansas, at Fort Smith (19-21)
Georgia, at Savannah (19-21)
Illinois, at Peoria (12-15)
Indiana, at Indianapolis (19-21)
Iowa, at Des Moines (5-7)
Louisiana, at New Orleans (1-3)
Maryland, at Baltimore (5-6)
Missouri, at St. Joseph (4-7)
Montana, at Missoula (1-3)
Nebraska, at Omaha (12-14)
New Jersey, at Asbury Park (7-9)
New York, at Buffalo (12-16)
North Carolina, at Pinehurst (12-14)
North Dakota, at Fargo (12-14)
South Carolina, at Columbia
Tennessee, at Knoxville (12-15)
Virginia, at Old Point Comfort (8-10)
West Virginia, at White Sulphur Springs (19-21)

June

Colorado, at Colorado Springs (19-21)
Idaho, at Sun Valley
Maine, at Portland (26-28)
Mississippi, at Biloxi (9-11)
Nevada, at Reno (7)
New Mexico, at Albuquerque
Pennsylvania, at Bedford (3-5)
South Dakota, at Rapid City (15-17)
Utah, at Salt Lake City (26-28)
Wyoming, at Cody

July

Washington, at Portland

September

Southern California, at Los Angeles (8-11)
Hawaii, at Honolulu

November

Ohio, at Columbus

STATE BOARDS OF DENTAL EXAMINERS

Kentucky, at Louisville, June 10-13. Leon M. Childers, 1312 First Nat'l Bank Bldg., Lexington, Secretary.

Mississippi, at Jackson, June 17. G. L. Clement, Pontotoc, Secretary.

New Jersey, June 23-28. W. A. Wilson, 148 W. State St., Trenton, Secretary.

South Dakota, at Sioux Falls, January 24-27. C. H. Boyden, Mitchell, Secretary.

AMERICAN ASSOCIATION OF ORTHODONTISTS

THE thirty-ninth meeting of the American Association of Orthodontists will be held at the Waldorf Astoria Hotel in New York, N. Y., May 5-8.

MAX E. ERNST, *Secretary,*
1250 Lowry Medical Arts Bldg.,
St. Paul, Minn.

AMERICAN PUBLIC HEALTH ASSOCIATION

THE seventieth annual meeting of the American Public Health Association will be held in Atlantic City, N. J., October 14-17. Headquarters, Convention Hall; residence headquarters, Hotel Traymore.

WILLIMINA RAYNE WALSH,
Associate Secretary,
1790 Broadway,
New York, N. Y.

CHICAGO DENTAL SOCIETY

SHORTLY after January 1, the preliminary program of the Chicago Dental Society's 1941 Midwinter Meeting, to be held at the Stevens Hotel February 17-20, inclusive, will be in the mails. American Dental Association members residing within a radius of 300 miles of Chicago, as well as all dentists outside this zone who attended the 1940 meeting, will receive copies. Any American Dental Association member who is not in these two categories can secure a copy by addressing the Chicago Dental Society, 30 North Michigan Ave., Chicago, Ill.

LEO W. KREMER, *Secretary,*
30 North Michigan Ave.,
Chicago, Ill.

DALLAS MIDWINTER DENTAL CLINIC

THE fourteenth annual meeting of the Dallas Midwinter Dental Clinic will be held in Dallas, Texas, at the Hotel Adolphus, April 21-23, immediately after an all-day session of the House of Delegates of the Texas State Dental Society, April 20. A three-day study course will be given by Fred C. Meyers, Minneapolis, Minn., on "Restorative Dentistry"; W. Clyde Davis, Lincoln, Nebr., on "Synthetic Porcelain"; George W. Christiansen, Detroit, Mich., on "Oral Surgery," and O. M. Dresen, Milwaukee, Wis., on "Prosthetic Dentistry." April 22, the members of the Dallas County Dental Society will present table clinics, after the banquet. The fee for the full three-day course is $15, including a ticket to the banquet. All members of the American Dental Association are invited. Presentation of a 1941 membership card is requested on registration.

PHELPS J. MURPHEY, *Chairman,*
Publicity Committee,
Fairmount and Welborn Sts.,
Dallas.

FIVE STATE POST GRADUATE CLINIC

THE tenth annual Five State Post Graduate Clinic of the District of Columbia Dental Society will convene at the Mayflower Hotel, Washington, March 9-13.

WALTER R. RATH, *Chairman,*
Publicity Committee.

GREATER PHILADELPHIA ANNUAL MEETING

THE Greater Philadelphia Annual Meeting will be held February 4-7, at the Benjamin Franklin Hotel.

ABRAM COHEN, *Chairman,*
Publicity Committee,
269 South 19th St.,
Philadelphia, Pa.

PACIFIC COAST SOCIETY OF ORTHODONTISTS

THE eighteenth general meeting of the Pacific Coast Society of Orthodontists will be held at the Palace Hotel in San Francisco, Calif., February 20-22.

EARL L. LUSSIER, *Secretary,*
450 Sutter Bldg.,
San Francisco, Calif.

SOUTHWESTERN SOCIETY OF ORTHODONTISTS

THE twentieth annual meeting of the Southwestern Society of Orthodontists will be held at the Hilton Hotel, Lubbock, Texas, February 2-5.

R. E. OLSON, *Secretary,*
Union Nat'l Bank Bldg.,
Wichita, Kan.

WASHINGTON UNIVERSITY SCHOOL OF DENTISTRY SEVENTY-FIFTH ANNIVERSARY

WASHINGTON UNIVERSITY SCHOOL OF DENTISTRY, St. Louis, Mo., will celebrate its seventy-fifth anniversary April 7-12, under the sponsorship of the dental alumni association. The week will be devoted to lectures and refresher courses. The profession is invited to participate. For further information, address the Seventy-Fifth Anniversary Committee, 4952 Maryland Ave., St. Louis, Mo.

ALABAMA DENTAL ASSOCIATION

THE seventy-second session of the Alabama Dental Association will be held at the Tutwiler Hotel, Birmingham, April 8-10, celebrating the centennial of the world's first dental law, which was enacted in Alabama in 1841.

GEORGE W. MATTHEWS, *Secretary*,
905 Protective Life Bldg.,
Birmingham.

GEORGIA DENTAL ASSOCIATION

THE seventy-third annual meeting of the George Dental Association will be held at Savannah, May 19-21, with headquarters at the Hotel DeSoto.

R. H. MURPHY, *Secretary*,
Macon.

ILLINOIS STATE DENTAL SOCIETY

THE next annual meeting of the Illinois State Dental Society will be held in Peoria, May 12-15.

L. H. JACOB, *Secretary*,
Jefferson Building,
Peoria.

KANSAS STATE DENTAL ASSOCIATION

THE seventieth annual session of the Kansas State Dental Association will be held in the Municipal Auditorium, Topeka, April 27-30.

FRED A. RICHMOND, *Secretary*,
Huron Building,
Kansas City.

KENTUCKY STATE DENTAL ASSOCIATION

THE eighty-first annual meeting of the Kentucky State Dental Association will be held at the Brown Hotel, Louisville, April 7-9.

J. L. WALKER, *Secretary*,
640 Barbee Way South,
Louisville.

LOUISIANA STATE DENTAL SOCIETY

THE sixty-first annual meeting of the Louisiana State Dental Society will be held May 1-3, at the Roosevelt Hotel, New Orleans.

JULIAN S. BERNHARD, *Secretary*,
417 Medical Arts Bldg.,
Shreveport.

MASSACHUSETTS DENTAL SOCIETY

THE Massachusetts Dental Society will meet April 14-17.

PHILIP E. ADAMS,
106 Marlboro St.,
Boston.

MICHIGAN STATE DENTAL SOCIETY

THE eighty-fifth annual meeting of the Michigan State Dental Society will be held in Detroit, April 21-23.

WILLIAM R. DAVIS, *Secretary*,
Michigan Dept. of Health,
Lansing.

MINNESOTA STATE DENTAL ASSOCIATION

THE fifty-eighth annual session of the Minnesota State Dental Association will be held in the Municipal Auditorium, Minneapolis, February 25-27.

L. M. CRUTTENDEN, *Secretary*,
498 Lowry Medical Arts Bldg.,
St. Paul.

MISSOURI STATE DENTAL ASSOCIATION

THE Missouri State Dental Association will hold its next meeting in St. Joseph, May 4-7.

C. W. DIGGS, *Secretary*,
Exchange National Bank Bldg.,
Columbia.

MONTANA STATE DENTAL ASSOCIATION

THE thirty-eighth annual session of the Montana State Dental Association will be held in Missoula, May 1-3.

T. T. RIDER, *Secretary*,
9 Higgins Block,
Missoula.

NEW JERSEY STATE DENTAL SOCIETY

THE next annual meeting of the New Jersey State Dental Society will be held in

Asbury Park, May 7-9, at the Berkeley Carteret Hotel.

F. K. HEAZELTON, *Secretary,*
223 E. Hanover St.,
Trenton.

DENTAL SOCIETY OF THE STATE OF NEW YORK

THE Dental Society of the State of New York will convene in Buffalo for its seventy-third annual meeting, May 12-16, at the Statler Hotel. Members of the American Dental Association and the Canadian Dental Association are invited.

LEON J. GAUCHAT, *Chairman,*
Press and Publications,
333 Linwood Ave.,
Buffalo.

PENNSYLVANIA STATE DENTAL SOCIETY

THE seventy-third annual meeting of the Pennsylvania State Dental Society will be held at the Bedford Springs Hotel, Bedford, June 3-5.

C. J. HOLLISTER,
Executive Secretary,
217 State St.,
Harrisburg.

OKLAHOMA STATE DENTAL SOCIETY

THE next meeting of the Oklahoma State Dental Society will be held in Oklahoma City, April 27-30.

O. W. BOYER, *Secretary,*
Perry.

TENNESSEE STATE DENTAL ASSOCIATION

THE seventy-fourth annual meeting of the Tennessee State Dental Association will be held at the Hotel Andrew Johnson, Knoxville, May 12-15.

HOWARD M. TAYLOR, *Secretary,*
206 Medical Arts Bldg.,
Knoxville.

VIRGINIA STATE DENTAL ASSOCIATION

THE next annual meeting of the Virginia State Dental Association will be held at the Chamberlain Hotel, Old Point Comfort, May 8-10.

J. E. JOHN, *Secretary,*
Medical Arts Bldg.,
Roanoke.

KENTUCKY STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Kentucky State Board of Dental Examiners will be held June 10-13, 1941 at the University of Louisville, Dental School, Louisville. Dentists having graduated prior to 1941 and desiring to stand examination before this board must have filed application, complete with full information requested, at this office not later than April 10. Applications of 1941 graduates must be in our file by May 30. Ample time should be allowed for securing all data required. For application forms and further information, apply to

LEON M. CHILDERS, *Secretary,*
1312 First Nat'l Bank Bldg.,
Lexington.

MISSISSIPPI STATE BOARD OF DENTAL EXAMINERS

THE Mississippi State Board of Dental Examiners will hold its next examination in Jackson beginning the third Tuesday in June 1941. Applications should be in the hands of the secretary thirty days before the date of the meeting. For further information, address

G. L. CLEMENT, *Secretary,*
Pontotoc.

STATE BOARD OF REGISTRATION AND EXAMINATION IN DENTISTRY OF NEW JERSEY

THE State Board of Registration and Examination in Dentistry of New Jersey will hold its annual examinations, commencing June 23 and continuing for five days thereafter. On application to the secretary, a copy of the requirements and rules for applicants, instruction sheet and preliminary application blank will be sent. Any person desiring to apply as a candidate must file the preliminary application blank, together with the examination fee of $25, on or before March 15, for the succeeding June examinations or before September 1 for the succeeding December examinations.

W. A. WILSON, *Secretary,*
148 W. State St.,
Trenton.

SOUTH DAKOTA BOARD OF DENTAL EXAMINERS

THE South Dakota State Board of Dental Examiners will hold its next examination at the Carpenter Hotel, Sioux Falls, January

'24-27. Applications should be in the hands of the secretary ten days before the date of the meeting. For further information, address

C. H BOYDEN, *Secretary,*
Mitchell.

DENTAL INTERNSHIPS

APPLICATIONS for dental internships are now being received at the Baltimore (Md.) City Hospitals. Senior students interested can obtain application blanks by writing to the superintendent, Baltimore City Hospitals, 4940 Eastern Ave., Baltimore, Md. Applications should be in by February 1.

P. J. MCMILLIN, *Superintendent.*

DENTAL RESIDENCY, WESTERN PENNSYLVANIA HOSPITAL

A SIX months dental residency, beginning January 1, is available at the Western Pennsylvania Hospital. Graduates who are interested are asked to communicate with the superintendent, M. H. Eichenlaub, 4800 Friendship Ave., Pittsburgh, Pa.

J. A. GARDNER,
Chief of the Dental Department.

DENTAL INTERNSHIP, BARONESS ERLANGER HOSPITAL

THE Baroness Erlanger Hospital of Chattanooga, Tenn., has recently established facilities for a dental internship and is very desirous of filling the position. This 500-bed hospital, owned by the city and county, has recently established and equipped a dental clinic.

POSTGRADUATE COURSE OFFERED BY THE NEW YORK UNIVERSITY COLLEGE OF DENTISTRY
(Correction)

IN the announcement in the November JOURNAL of the course in fixed bridge construction to be given by the New York University College of Dentistry, the tuition fee should have been quoted as $100. The dates are Friday afternoon, 2:30 to 7:30, January 31-March 28, 1941. Apply to the Dean, New York University College of Dentistry, 209 East Twenty-Third St., New York, N. Y.

RESEARCH FELLOWSHIPS IN MEDICINE AND DENTISTRY BY THE GRADUATE SCHOOL OF THE UNIVERSITY OF ILLINOIS

THE Graduate School of the University of Illinois has established four research fellowships to be awarded for one year in the fields of medicine and dentistry in Chicago at a stipend of $1,200 per year (calendar year with one month's vacation). Fellows are eligible for reappointment in competition with the new applicants.

Candidates for these fellowships must have completed a training of not less than eight years beyond high school graduation. This training may have been acquired in any one of the following ways, or the equivalent thereof:

1. Work leading to the B.S. and M.D. degrees. (In some instances, the candidates would have the M.S. degree, or an additional year or two of hospital training beyond the intern year).

2. Work leading to the B.S., M.S. and D.D.S. degrees.

3. Work leading to the B.S. or B.A. degree in a four-year collegiate course and to the D.D.S. degree.

4. Work leading to the B.S., D.D.S. and M.D. degrees.

Candidates should indicate the field of research in which they are interested and submit complete transcripts of their scholastic credits, together with the names of three former science teachers as references. March 1 is the deadline for acceptance of applications. Announcement of the fellowship awards will be made April 1, becoming effective September 1.

Formal application blanks can be secured from the secretary of the Committee on Graduate Work in Medicine and Dentistry, 1853 W. Polk St., Chicago, Ill.

CIVILIAN DENTISTS WANTED FOR DUTY WITH CIVILIAN CONSERVATION CORPS

A NUMBER of vacancies will exist in the Civilian Conservation Corps in the Eighth Corps Area wherein the services of dentists can be utilized as civilian employes (dentists) or as contract dentists. Applicants must be graduates of Class A dental schools. Applications should be addressed to the Surgeon, CCC, Headquarters Eighth Corps Area, Fort Sam Houston, Texas. Consideration will be given to applicants as follows:

1. Dental Reserve Corps officers can be placed on duty under Classification P-2 at the initial rate of pay of $2,600 a year.

2. Dentists who are not members of the

Dental Reserve Corps can be placed on duty as contract dentists at the initial rate of pay of $2,600 a year.

Both of the above-mentioned groups must consider themselves physically qualified and, if selected, they must report to their first place of assignment at their own expense. If found physically qualified at that time, they will be appointed at the respective rates. Upon being relieved from duty either at their own request or for the convenience of the government, the dentist must bear the expense of return transportation.

ILLINOIS STATE ORAL HYGIENISTS' ASSOCIATION

THE annual meeting of the Illinois State Oral Hygienists' Association is to be held in conjunction with the seventy-seventh annual Midwinter Meeting of the Chicago Dental Society, at the Stevens Hotel, February 17-20. All members of the American Dental Hygienists' Association are invited to attend.

MARGARET MILLER, *Secretary*,
311 E. Chicago Ave.,
Chicago, Ill.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING NOVEMBER 1940

November 5

No. 2,220,103, ALFRED E. HANSSEN. Dental matrix instrument.

No. 2,220,674, JOHN L. BLOOMHEART. Mouth prop.

No. 2,220,734, THOMAS E. J. SHANAHAN. Method and means for obtaining accurate occlusion.

No. D-123,388, HAROLD PALMER DUEY. Design for a toothbrush.

November 12

No. 2,221,302, DAN D. MIZZY and DAVID L. DURST. Investment ring heater.

No. 2,221,363, ROBERT C. SWEATT. Toothbrush.

No. 2,221,739, DAVID REITER. Hypodermic syringe.

November 19

No. 2,222,531, JAMES J. DWYER. Foiling device for wax dentures.

November 26

No. 2,222,781, THOMAS E. MOORE. Dental investment material.